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STUDIES ON THE BIOCHEMISTRY OF SULPHUR

XII. PRELIMINARY STUDIES ON AMINO-ACID TOXICITY AND AMINO-ACID BALANCE

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Osborne and Mendel (1915) showed that an adequate diet with casein as the source of protein became inadequate as the casein percentage was lowered from 15-18 per cent to 9 per cent, or slightly less, but could be made adequate for growth by the addition of free cystine provided the protein level was not too low.

In previous work dealing with cystine and cystine amine studies, Sullivan, Hess, and Sebrell (1931), by decreasing the casein content of an adequate diet used by Goldberger and, subsequently, Sebrell, made the basal diet (No. 349) given in Table 1.

TABLE 1.—*Basal diet No. 349*

Ingredients	Quantity
	<i>Grams</i>
Casein, leached.....	4.0
Salt mixture (O. & M.).....	4.0
Cod-liver oil.....	2.0
Cottonseed oil.....	3.0
Brewer's yeast, dried.....	5.0
Cornstarch.....	82.0

Young albino rats placed on this diet when 27-31 days old, and at approximately 55 grams weight, grew subnormally. At the end of 142 days the gain in weight of four rats on this diet was 78, 79, 81, and 83 grams, respectively, with an average of 80.25 grams. The replacement of 0.5 per cent cornstarch by 0.5 per cent cystine in this basal ration made the diet excellent for the growth of the four rats, with gains in weight at the end of 139 days (3 rats) and 140 days (1 rat) of 130, 133, 145, and 155 grams, respectively, or an average gain of 141 grams over the period. At the end of the 139 and 140 days feeding, when the experiment was stopped, the rats on the basal diet plus cystine weighed 186, 189, 200, and 215 grams, respectively, and seemed in excellent condition in every way.

Considerable study has been made on the effect of injecting various amino acids into animals. Though injection experiments are somewhat foreign to dietary studies, they may be referred to briefly.

Blum (1903) found that the intravenous injection of approximately 1.0 gram of cystine per kilo resulted in the death of a dog in a short time. Autopsy revealed severe hemorrhagic nephritis.

Newburgh and Marsh (1925) injected a large number of amino acids intravenously into dogs and rabbits and studied the resulting changes in the kidney. Alanine, leucine, glycine, phenylalanine, and glutamic acid gave no evidence of renal injury in doses as large as 2 grams per kilo of body weight. Arginine and aspartic acid were mildly nephrotoxic, while damage was produced by lysine, histidine, tyrosine, tryptophane, and cystine. The action of cystine was especially pronounced.

Lignac (1926) injected seven mice intramuscularly or subcutaneously, over a period of three weeks, with 1 gram of cystine suspended in water. The animals were then killed. The spleen and liver were gray white, apparently with crystals of cystine. The spleen was enlarged and so was the kidney. Crystals showed in sections of the spleen, liver, and kidney capsule. Histologically the renal cortex showed cloudy swelling.

Injury to rats from small amounts of free cystine in the diet has been reported by other investigators. Lewis (1925) administered cystine orally as the sodium salt in doses of 1.0 to 4.0 grams for three to four consecutive days to two fasting rabbits and to two rabbits on a diet of oats and cabbage. All the animals died. Histologically Warthin found acute passive congestion of the kidney, cloudy swelling of the convoluted tubules, and casts in the collecting tubules. Curtis, Newburgh, and Thomas (1927), in feeding experiments with rats, found that the addition of as little as 0.5 per cent of cystine to their basal diet containing 18 per cent casein produced evidence of renal injury after the diet had been ingested continuously for four or five months. Later Cox, Smythe, and Fishback (1929) found that 0.3 to 0.9 per cent of free cystine in the diet is nephrotoxic to young rats of 60 grams weight or less, but not to rats of 80-90 grams weight. On the other hand, Addis, MacKay, and MacKay (1926-27), in long-continued feeding experiments (330-360 days), found no kidney injury when 1 per cent of free cystine was fed in the diet to rats which at the beginning of the experiment were 30 days old and weighed about 60 grams.

In the diets of Addis, MacKay, and MacKay there was 10 per cent dried yeast (Harris). In our basal diet there was 5 per cent dried yeast. In the feeding experiments where small amounts of free cystine produced kidney injury there were 50 mg. of a yeast vitamin extract. It would seem that high amounts of dried yeast may offset the injurious action of the free cystine on the kidney. This possibility is suggested by Hartwell's (1928) experience in preventing kidney injury, due to edestine, by the use of autoclaved marmite. It is

especially indicated by the findings of Cox and Hudson (1930) that the cystine nephrosis earlier observed by Cox, Smythe, and Fishback can be prevented by the inclusion in the diet of a sufficient amount of Osborne and Wakeman's vitamin B concentrate of yeast. According to Cox and Hudson, the active factor preventing the cystine nephrosis is not identical with any of the known accessory food substances.

Whatever may be the explanation, the fact remains that the young rats on the basal diet No. 349 with 0.5 per cent cystine grew well and were in excellent condition when the feeding was stopped. The experiment suggested a study of the effect of higher levels of cystine and of other available amino acids when added to this basal diet. In carrying out these experiments, results were obtained on the toxicity of a number of amino acids, and evidence was gathered indicating that cystine in suitable amounts offsets to a considerable degree the toxicity of tyrosine. The results, though striking, are merely preliminary to a study of amino-acid toxicity and to amino-acid balance, and are reported as such.

EXPERIMENTAL

The basal diet given in Table 1 was used in the experiments presented in this paper. The ingredients of the basal diet were the same as described in paper XI of this series (Sullivan, Hess, and Sebrell, 1931). The cystine was a highly purified sample with a rotation of $(\alpha)_D^{20} - 213.1$, determined on a 1 per cent solution in N hydrochloric acid. The tyrosine, tryptophane, glycine, and glutamic acid were high-grade commercial samples. The lysine was a C. P. monohydrochloride made in the laboratory; the glutathione was extracted from yeast by Pirie's (1930) modification of the Hopkins (1929) procedure. The amino acids used replaced a corresponding amount of cornstarch. Experiments were carried out with cystine and other available amino acids at different levels as given under the separate headings.

In every case young male white rats (27-31 days old and weighing 55-60 grams) were selected as the experimental animals. All the rats were from the same stock colony, bred at the National Institute of Health for nutrition studies. All the young rats were from mothers on a standard régime, described in a previous publication (Sullivan, Hess, and Sebrell, 1931). This stock diet gave high fertility with a sturdy and numerous progeny.

AMINO ACIDS AT A 20 PER CENT LEVEL

Twenty grams of cystine, tyrosine, tryptophane, and lysine, respectively, replaced 20 grams of cornstarch in the basal diet to make 100 grams of the diet. The cystine-fed rats died in from 3 to 5 days; the tyrosine-fed, in from 5 to 6 days; the tryptophane-fed, in from 9 to

11 days. One of the rats on the 20 per cent lysine diet died on the thirtieth day, and so the other 3 rats on this diet were killed. In all cases there was a rapid loss of weight.

Liver and kidney injury was especially noted in the rats fed cystine. The tyrosine-fed rats gave a striking picture. In general, the legs were swollen and reddened; although able to crawl, the rats dragged the hind legs; the eyes were closed with a dried, reddish-brown secretion, the cornea appeared roughened, and the animals were apparently blind; the intestines contained reddish-black material; the liver was apparently normal, but, in general, the kidney was somewhat mottled. Some evidence of kidney injury was noticeable in the rats fed tryptophane and lysine.

AMINO ACIDS AT A 10 PER CENT LEVEL

Ten grams of cystine, tyrosine, glutamic acid, and glycine, respectively, replaced 10 grams of cornstarch in the basal diet to make 100 grams of the diet. Twenty-five grams of reduced glutathione equivalent to 10 grams of cystine replaced 25 grams of cornstarch in the basal diet to make 100 grams of the diet. Cystine and tyrosine were definitely toxic. The 4 rats on cystine died in 2, 3, 4, and 13 days; the 2 rats on tyrosine died in 7 days. The 4 glycine-fed rats lost 6 to 9 grams in weight, and were killed on the fifteenth day. Glutamic acid showed little, if any, toxicity. All the rats gained in weight. On the thirty-ninth day, when they were killed, the rats weighed 92, 94, 107, and 110 grams, respectively, with an average gain of 43 grams. Glutathione, in amounts equivalent to 10 per cent cystine, seemed less toxic than 10 per cent cystine. Only 2 rats were used. One died in strychnine-like convulsions on the ninth day, with no loss in weight, and the other lost 4 grams in weight by the twenty-fourth day, when it was killed. On the other hand, a mixture of the basal diet plus 10 per cent cystine, 6.5 per cent glycine, and 12.5 per cent glutamic acid, all added in the free state in place of cornstarch, was decidedly toxic. Three of the four rats were dead within three days, and the fourth was moribund and was killed on the fourth day. In the case of glycine and glutamic acid, no gross lesions were found. The cystine-fed rats showed liver and kidney injury. The tyrosine caused much less liver and kidney injury than did cystine. On the other hand, in the case of tyrosine feeding there was swelling of the legs and the eyes were closed by a dried, dark secretion. The cystine results verify the conclusion of Curtis and Newburgh (1927) that 10 and 20 per cent free cystine in the diet act like powerful poison to rats, with injury to the kidney and liver.

Experiments with basal diet plus 10 per cent tyrosine and 5 per cent cystine.—While the 2 rats on the basal diet plus 10 per cent tyrosine died in 7 days, showing a loss in weight of 18 and 19 grams, respec-

tively, the 4 rats on the basal diet plus 10 per cent tyrosine and 5 per cent cystine lived 10, 10, 13, and 20 days, respectively, with a weight loss varying from 8 to 13 grams, or an average loss of 10.5 grams. This experiment gave some evidence that the addition of cystine counteracts somewhat the killing action of the 10 per cent tyrosine. The clinical symptoms manifested were predominantly those characteristic of tyrosine toxicity—swelling and reddening of the legs,

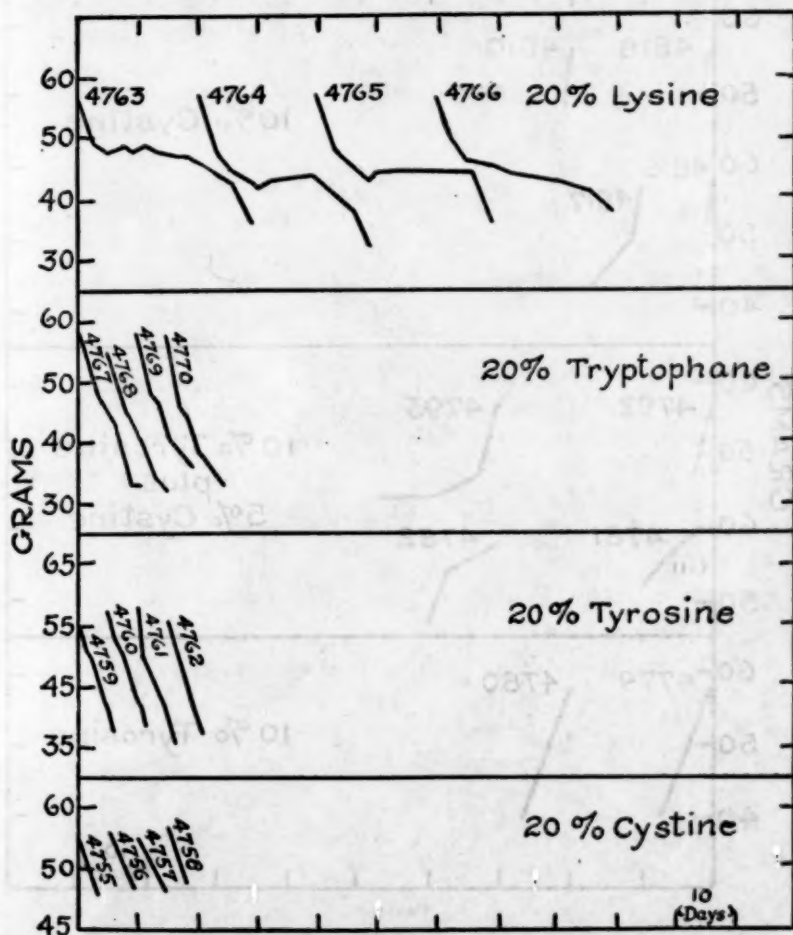


CHART I

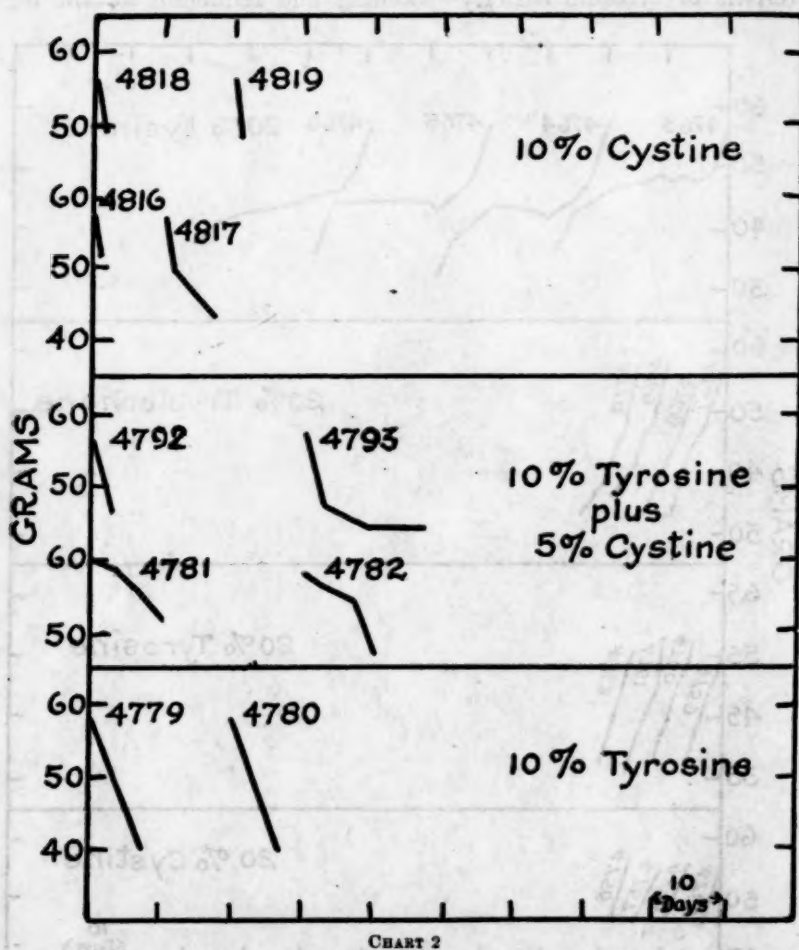
reddish-brown secretion about the eyes, and in some cases partial loss of the use of the legs. Some evidence of liver and kidney injury was noted.

FIVE PER CENT LEVEL OF AMINO ACIDS

Five grams of cystine and of tyrosine, respectively, replaced 5 grams of cornstarch in the basal diet to make 100 grams of the diet.

Cystine.—Four rats, each weighing 56 grams, were placed on the basal diet plus 5 per cent cystine. One died on the thirty-ninth day,

with a weight loss of 10 grams. The other three made gains in weight. On the sixty-seventh day, when they were killed, these three rats weighed 69, 91, and 99 grams, respectively. Four rats on the basal diet unsupplemented weighed, on the sixty-fifth day, 107, 105, 106, and 107 grams, respectively. Histological examination of the organs of the rats fed 5 per cent cystine (made by Passed Asst. Surg.



R. D. Lillie) showed more or less fatty degeneration in the liver and parenchymatous degeneration of the kidneys. Since Curtis, Newburg, and Thomas found that 5 per cent cystine added to the diet used by them killed the rats in about two weeks, it is evident that the basal diet plus 5 per cent cystine employed by us is very much less toxic.

Five per cent tyrosine.—Tyrosine at the 5 per cent level was decidedly toxic. The two rats used died on the seventh and eighth days, respectively. The two rats which were placed on the basal diet plus 5 per cent tyrosine died on the thirty-ninth day.

respectively. The eyelids were closed by a dried, reddish-brown secretion; the legs were more or less reddened and swollen. The liver and kidneys, however, appeared normal.

Tyrosine plus cystine.—Four rats were placed on the basal diet with 5 per cent tyrosine and 5 per cent cystine replacing 10 per cent of the cornstarch. Whereas 5 per cent tyrosine killed the rats in 8 days, the

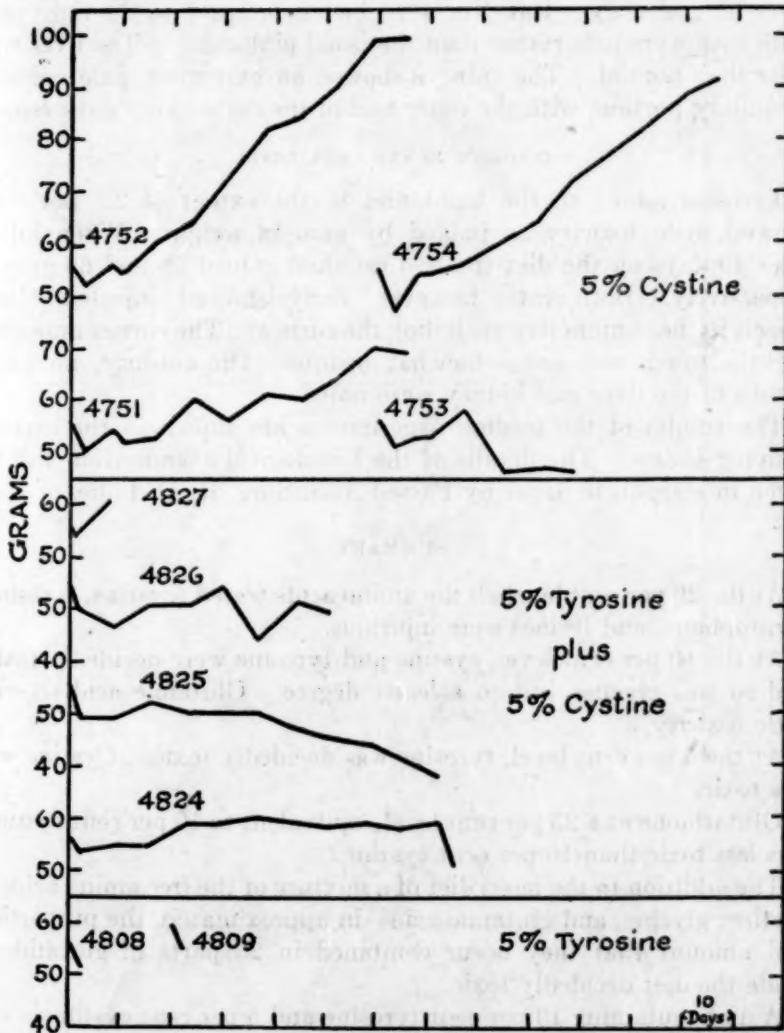


CHART 3

rats on the basal diet plus 5 per cent tyrosine and 5 per cent cystine lived 10, 53, and 72 days, respectively, and the fourth was killed on the seventy-sixth day. It is evident that the presence of the cystine offsets to a considerable degree the toxic action of the tyrosine. Rat No. 4827, which died on the tenth day, with a slight gain in weight, showed at autopsy a mottled and very friable liver. The other rats showed

more or less loss in weight. Rat No. 4824, killed on the seventy-sixth day, gave no external evidence of disease. On autopsy, however, the liver was paler than normal and slightly mottled. The kidneys were large, pale, and granular, with a cortex paler than normal. Rat No. 4825 had a reddish-brown, dried secretion around the eyes, which appeared to be in bad condition. The paws and ears were pale and more or less scaly. Rat No. 4826 had a cataract on the right eye. Both eyes were pale rather than the usual pink color. The liver was paler than normal. The kidneys showed an extremely pale corticomedullary portion, with the outer half of the cortex very dark red.

TYROSINE 2.5 PER CENT LEVEL

Tyrosine added to the basal diet to the extent of 2.5 per cent showed little toxicity as judged by gain in weight. When killed after 49 days on the diet the two rats had gained 56 and 69 grams, respectively. Both rats, however, early showed injected blood vessels in the conjunctiva encircling the cornea. The cornea appeared slightly roughened and somewhat opaque. On autopsy, no gross lesions of the liver and kidney were noted.

The results of the feeding experiments are shown in the accompanying charts. The details of the histological examination will be given in a separate paper by Passed Asst. Surg. R. D. Lillie.

SUMMARY

At the 20 per cent level all the amino acids tested (cystine, tyrosine, tryptophane, and lysine) were injurious.

At the 10 per cent level, cystine and tyrosine were decidedly toxic, and so was glycine, but to a lesser degree. Glutamic acid showed little toxicity.

At the 5 per cent level, tyrosine was decidedly toxic. Cystine was less toxic.

Glutathione at a 25 per cent level, equivalent to 10 per cent cystine, was less toxic than 10 per cent cystine.

The addition to the basal diet of a mixture of the free amino acids—cystine, glycine, and glutamic acid—in approximately the proportion and amount that they occur combined in 25 parts of glutathione made the diet decidedly toxic.

A diet containing 10 per cent tyrosine and 5 per cent cystine is less toxic than a diet containing 10 per cent tyrosine alone.

A diet containing 5 per cent tyrosine and 5 per cent cystine was much less toxic than a diet containing 5 per cent tyrosine alone. Therefore it would seem that cystine counteracts to a considerable degree the toxic action of tyrosine.

The symptoms of tyrosine toxicity are strikingly different from those of cystine toxicity.

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HISTOPATHOLOGIC CHANGES PRODUCED IN RATS BY THE ADDITION TO THE DIET OF VARIOUS AMINO ACIDS

(Glycine, lysine, tryptophane, cystine, tyrosine and glutamic acid, and of glutathione, and of mixtures of some of them)

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In connection with a current study on the toxic effects of various amino acids by Sullivan, Hess, and Sebrell,¹ specimens, chiefly of liver and kidney, from their experimental animals were submitted to the writer for histologic examination. Experimental and gross pathologic data are presented in their report and will be referred to here only in so far as is necessary to correlate the data herewith presented with their presentation.

¹ Pages 75-83 of this issue of Public Health Reports.

As the literature is being reviewed in the report by Sullivan, Hess, and Sebrel, it will be unnecessary to cover it in detail in this paper.

MATERIAL AND METHODS

Our experimental material consisted of livers and kidneys, and sometimes other organs, from Sullivan, Hess, and Sebrell's feeding experiments with amino acids. The tissues were removed as promptly as possible after death, the animals often being killed with carbon monoxide and autopsied immediately. Fixation was done in duplicate in Orth's fluid (2.5 per cent potassium bichromate 10, strong formalin 1) and in 10 per cent formalin (4 per cent formaldehyde gas). The first was used for the preparation of paraffin sections, the second for frozen sections. Paraffin sections were stained routinely with Weigert's acid iron chloride hematoxylin and Van Gieson's picrofuchsin and with Mayer's acid hemalum and eosin. Frozen sections were stained with alum hematoxylin and Sudan IV (saturated in equal parts of acetone and 70 per cent alcohol), with Nile-blue sulphate, and one mounted unstained in glycerin for study with polarized light.

CONTROLS

As the experimental diets usually contained only 4 per cent casein, two sets of controls were used—one a stock diet containing 20 per cent casein and the other the basic experimental diet with 4 per cent casein and corn starch taking the place of the amino acids.

On the first diet livers and kidneys of two rats (Nos. 4913 and 4914) were examined.

In No. 4913 the liver cells were generally coarsely granular and scattered hepatic, and Kupffer cells were packed with fine droplets of neutral fat. The renal convoluted tubules generally showed well-preserved basal striation; a few tubules in the deep cortical zone appeared granular and contained basally located fine droplets of neutral fat. The findings in rat No. 4914 were essentially identical.

On the low protein high starch basic diet the four rats, Nos. 4669, 4670, 4671, and 4672, showed practically identical findings, which are illustrated by the protocol of rat No. 4670 (killed) (Path. No. 843):

Liver.—With Sudan IV there is an irregular infiltration of the liver cells with coarse red globules and finer poorly stained droplets largely about the centers of the lobules, with fine droplets also in the Kupffer cells in these and other parts of the lobules. All of this fat stains blue with Nile-blue sulphate. A few doubly refracting crystals and irregular masses are scattered among them. The marginal liver cells show some increased granularity, oxyphilia, and nuclear pyknosis.

Kidney.—A few of the deep group of convoluted tubules show cell swelling and granularity. Most of the convoluted tubular epithelium is not thickened and plainly striated basally. A small amount of foamy coagulum is present in some tubules. No fatty changes are apparent in frozen sections stained by Sudan IV or Nile blue or in unstained sections under crossed Nicol prisms.

Here, too, the kidneys are essentially the same as in the control diet, but the livers show a moderate centrolobular fatty acid and lipid infiltration. This would appear to be attributable to the high carbohydrate content of the diet, and was associated with a failure to grow normally.

GLYCINE

A single series of four rats on 10 per cent glycine (rats Nos. 4885, 4886, 4887, 4888) may best be illustrated by the protocol of rat No. 4887 (Path. No. 918):

Liver.—No focal necroses, cells often coarsely granular and contain diffusely moderate numbers of fine fat droplets stained deep red by Sudan IV, usually unstained by Nile-blue sulphate and nearly all singly refracting.

Kidney.—Essentially normal.

The hepatic fat appeared to be more plentiful in the centers of the lobules in No. 4886, in their peripheries in No. 4885, and irregularly in No. 4888. Basal fat droplets were seen in a few of the deep convoluted renal tubules in Nos. 4886 and 4888.

Hepatic fat deposition appears to be increased over that in the control groups.

LYSINE

The group of four rats (4763, 4764, 4765, 4766) on 20 per cent lysine may be illustrated by the protocol of rat No. 4766 (Path. No. 822):

Liver.—Shows diffuse fatty degeneration of the liver cells except those bordering directly on the hepatic venules. The droplets are fine to medium in size, stain red with Sudan IV, a few pink and violet, but most deep blue with Nile-blue sulphate and are singly refracting. In paraffin sections the cytoplasm between the much fewer coarser vacuoles is finely to rather coarsely granular, the finest sudan and Nile-blue staining droplets not being dissolved out by the acetone-benzol process of embedding. There is no hemorrhage or necrosis.

Kidney.—Shows swelling and opacity of the cytoplasm of the convoluted tubules generally. The opaque cytoplasm is generally very finely granular and presents numerous clear vacuoles next the basement membrane in the paraffin sections. These vacuoles are generally filled with fat droplets staining red with Sudan IV and often pink or violet, less often blue with Nile-blue sulphate. Only scattered minute doubly refracting droplets are seen. These are not numerous in the superficial zone of the cortex, and are definitely more plentiful in the untreated, unstained section than in that stained with Nile blue and differentiated in very dilute acetic acid.

The kidneys in the other three were essentially similar. The liver in No. 4765 showed only patchy hydropic, but no fatty vacuolation, and the livers of Nos. 4763 and 4764 showed no lesions and no fat.

These renal changes may be characterized as an acute nephrosis, and are probably comparable to the granular degeneration of the cortical tubules observed by Newburgh and Marsh (1925) in the dog after intravenous administration of lysine.

TRYPTOPHANE

The three rats maintained on 20 per cent tryptophane showed essentially similar findings, as illustrated by the protocol of rat No. 4769 (Path. No. 798):

Kidney.—The epithelium of the proximal convoluted tubules is swollen, granular, and sometimes frayed. The distal group show compact, hyaline, or granular epithelial cytoplasm, small compact globular oxyphil bodies in their lumina, or hyaline casts in others.

Liver.—No focal lesions and no evidence of fatty infiltration or degeneration in paraffin sections.

Unfortunately no material for frozen sections was preserved in this group. The changes constitute a mild nephrosis, probably comparable in grade to that in Newburgh and Marsh's dog which received 1 gram per kilogram intravenously.

CYSTINE

Cystine was fed in 5, 10, and 20 per cent levels and produced a series of pathologic changes, which became progressively more acute and severe with the increasing proportion of the amino acid in the diet. As the findings in the individual rats were essentially similar for each level, the changes may be best presented by a selected individual protocol from each group.

5 per cent cystine.—Rats Nos. 4751, 4752, 4754, illustrated by protocol No. 833, rat No. 4754

Liver.—Many small nodules of closely packed lymphocytes and probably fibroblasts, sometimes with a few polymorphonuclears, averaging about 50 micra in diameter. Liver cells adjoining the portal area often show denser, sometimes finely vacuolated cytoplasm and slightly shrunken, hyperchromatic nuclei. Numerous liver cells in the intermediate zone are distended by coarse globules of fat, while most of the remainder of the liver cells contain greater or less numbers of fine fat droplets. In the central portions of the section the coarse globules stain pink with Nile blue; marginally they are dark blue. In and adjoining the portal areas are cells filled with globules stained faintly by Sudan IV and dark blue green by Nile blue. No lipoids are seen with polarized light.

Kidney.—The epithelial cytoplasm of the convoluted tubules is finely to coarsely granular, sometimes retaining brush borders, sometimes apparently continuous with somewhat more oxyphil intratubular hyaline exudate. The latter is often more deeply stained and forms compact casts, more often in the deeper cortex. These casts glow distinctly with crossed Nicol prisms. Rare lipid droplets are seen in the epithelium of the convoluted tubules, and only an occasional cortical (collecting) tubule contains fine sudan staining fat droplets. In the pyramidal tubules numerous fine fat droplets are seen in the basal half of the epithelial cells. These stain red with Sudan IV, deep blue with Nile-blue sulphate for the most part, and a few not staining with Nile blue are doubly refracting. The last are less in number in the acetone alcohol Sudan IV preparation than in the aqueous Nile-blue stain. The glowing of the casts under crossed Nicol prisms is absent in the preparation stained by the acetone-70 per cent alcohol solution of sudan.

10 per cent cystine.—Rats Nos. 4816, 4817, 4818, 4819, illustrated by protocol No. 876, rat No. 4819

Kidney.—Many of convoluted tubules appear cloudy and swollen; basal striation is often retained; many contain numerous small basally located fat droplets (neutral fat). Some of the coarse straight tubules contain many extremely small doubly refracting lipoid crystals.

Liver.—Narrow zones of congestion and coagulation necrosis of liver cells about portal areas. Liver cells here strongly oxyphil, with pyknotic or partially or completely karyolytic nuclei. Or there may be hemorrhagic necrosis with disappearance of cells. The liver cells elsewhere contain many small vacuoles containing chiefly neutral fat. Intense fatty degeneration is seen in the periportal zones. Only rare lipoid crystals are seen outside the necrotic zones with polarized light. Areas are also seen where the liver cells are about normal.

Rat No. 4817 showed no periportal necroses and relatively slight parenchymatous and no fatty degeneration in the kidney. Renal changes were also less marked in rat No. 4818, but the periportal necroses were partly hemorrhagic in this rat.

20 per cent cystine.—Rats Nos. 4755, 4756, 4757, 4758, illustrated by protocol No. 756, rat No. 4758

Liver.—Extensive periportal coagulation necroses of liver cells, with more or less hemorrhage, in places completely replaced and disrupted by hemorrhage, and more or less diffuse patchy medium and fine vacuolation of the liver cells. The vacuoles are filled with fat stained red by Sudan IV and deep blue by Nile blue, the distribution of it being more in the necrotic and necrobiotic areas. Among the fat globules are a few doubly refracting globules, some stained pink by Sudan IV, others unstained by either Nile blue or sudan.

Kidney.—The cytoplasm of the convoluted tubular epithelium is oxyphil, opaque in appearance, often vacuolated, with opaque rounded oxyphil masses next and in the lumen; often there is more or less pyknosis and sometimes complete karyolysis. Only a few groups of tubules show basally located fine fat droplets stained red by Sudan IV. None stained by Nile blue are found, nor are any doubly refractive globules seen.

The periportal necroses were purely coagulative in rat No. 4756; the findings in this and the other two rats were otherwise essentially similar.

The periportal necroses first described by Curtis and Newburgh (1927 (2)) were found in our material, as in theirs, on 10 and 20 per cent levels of cystine feeding, but in our material did not appear on lower levels. It would appear that the hepatic fatty changes were a manifestation of less severe injury and that they usually precede the necroses. Renal injury, though of similar character, appears to have been less pronounced in our material than in that of Curtis and Newburgh (1927 (1)) or Cox, Smythe, and Fishback (1929).

TYROSINE

Tyrosine was fed in levels of 2.5, 5, 10, and 20 per cent. On the lowest level fatty changes in the liver, similar to those seen on the

basic diet, appeared, while on higher levels the liver showed no lesions; the kidneys, only minor grades of parenchymatous degeneration in any level. An interesting finding is the diffuse glowing under polarized light of the contents of the coarse cortical straight tubules in rats on the 20 per cent level. This appearance seems to be peculiar to tyrosine-fed rats.

The more important findings in tyrosine intoxication are an exudative blepharitis and edema of the extremities. Only a few tissues from the ocular region were successfully sectioned and studied, and no histologic material from the edematous extremities or other viscera, lesions of which might explain such edema, was studied.

Protocol No. 771; rat No. 4759; 20 per cent level

Liver.—No lesions; no fat by Sudan IV or Nile blue. Lipoids are seen in the capillaries with polarized light.

Kidney.—Convolute tubules often show basal striation, or are swollen and finely granular or dilated and contain foamy oxyphil material. No fat is seen by Sudan IV or Nile blue. Minute doubly refractile crystals are seen in the blood in the veins. The contents of some of the coarse straight tubules glow diffusely with crossed Nicol prism. This appearance is not seen in the cortical convolute tubules or in the pyramids.

Small intestine.—The epithelium of the villi is elevated off the stroma by a row of coarse vacuoles with narrow oxyphil strands between them.

Spleen.—The follicles are small, the trabeculae are prominent, thin and fibrous, the pulp is anemic, contains some lymphocytes, and there is possibly some swelling of the sinus endothelium.

Eyelid.—In part of the section the epidermis shows three to five layers of prickle cells, a layer of eleidin cells, and several layers of keratinized squames. Fairly abruptly this area grades into one showing about one to two layers of prickle cells, an incomplete eleidin layer. Near the margin, both layers of the thin prickle-cell layer often show intranuclear, sometimes perinucleolar, vacuoles, sometimes a large clear area bounded by a dense chromatic nuclear membrane, some crescentic perinuclear clefts and cytoplasmic vacuoles. In the derma there is some apparent rarefaction (technical?) and some pericapillary lymphocyte infiltration. Hyperemia is not apparent. On the other side of the thick epidermal area (inner surface of lid) is an area of pyogenic ulceration in which the epidermis is replaced by a crust of squames and fibrin and leucocytes, the collagenous lamellae of the derma are apparently intact, the derma is edematous, containing numbers of leucocytes and lymphocytes and next the surface a narrow zone of fragmented (leucocyte?) nuclei.

Muscle.—Some areas of fragmentation, some of waxy degeneration. A small nerve appears intact.

In rats Nos. 4760 and 4762 there was breaking down of the center of the crystalline lens to amorphous oxyphil debris. Rat No. 4760 showed lymphocyte infiltration of the iris and ciliary body, and slight polymorphonuclear infiltration of the cornea.

CYSTINE AND TYROSINE

As longer survival of rats fed on mixtures of cystine and tyrosine was noted than on tyrosine alone, the histologic findings appear to be of considerable interest.

Of three rats fed on 5 per cent each of cystine and tyrosine, two were killed and showed moderately severe renal degenerative changes, advancing to necrosis in areas in rat No. 4824, but no hepatic lesions.

Protocol No. 953; rat No. 4826

Eye.—Cornea shows no lesions; retina appears normal; iris and ciliary small.

Spleen.—Perifollicular reticulum cell hyperplasia; pulp relatively anemic.

Kidney.—Epithelium of convoluted tubules generally swollen and finely granular; numerous large hyaline casts in collecting tubules in cortico-medullary zone; hyaline and few granular casts in pyramidal tubules. Rather marked patchy cortical congestion; no fatty changes.

Liver.—No evident lesions in paraffin sections and only occasional liver cells contain many fine fat droplets.

Similarly, one rat receiving 5 per cent cystine and 10 per cent tyrosine showed no hepatic lesions and in this instance practically no renal changes.

Rat No. 4827, receiving 5 per cent cystine and 5 per cent tyrosine, and rats Nos. 4781 and 4792 (5 per cent cystine and 10 per cent tyrosine) died and showed the typical periportal necroses of cystine poisoning in the liver, but fatty changes were absent in the two rats receiving 10 per cent tyrosine. However, rat No. 4827 (5 per cent tyrosine) showed diffuse fatty degeneration in the liver as well. Rat No. 4782 (5 per cent cystine and 10 per cent tyrosine, killed) showed some periportal cell oxyphilia and fatty degeneration but no actual necrosis.

Protocol No. 849; rat No. 4792 (dead 5 minutes)

Liver.—In a narrow zone about each portal area the liver cells are converted into finely vacuolated, hyaline, opaque, strongly oxyphil masses without nuclei, or marginally with nuclear pyknosis. Blood-filled capillaries with well-stained endothelial nuclei pass through these zones. Elsewhere there are scattered swollen clear liver cells containing coarse oxyphil granules and shrunken densely pyknotic nuclei. An earlier stage of this last process may be represented by rather large cells with poorly stained finely reticular cytoplasm and apparently normal nuclei. No fatty changes are seen, using Sudan IV, Nile-blue, and polarized light.

Kidney.—The proximal convoluted tubules are swollen and finely granular, the distal slightly swollen, and plainly striated basally. In the proximal group the free margin of the cells seems to be breaking down to granular detritus within the lumen. There is no evident fatty degeneration with Sudan IV, Nile-blue, or polarized light.

Muscle.—Partial hyalinization of some fibers; apparent multiplication of nuclei; no fatty degeneration.

Small intestine.—Reddish-brown amorphous material in dense masses and granules in lumen. Mucosa intact except for slight brownish discoloration of epithelium of tips of villi.

Eye.—Corneal epithelium shows large rounded irregular surface cells making an uneven surface. The outer layers show the normally poor nuclear staining, but the cells lack the normal flattening and degree of oxyphilia, appearing edematous and containing round, oxyphil nuclei rather than flattened ones.

No especial abnormality of uvea or iris noted.

The presence of corneal changes is of interest, especially as evidence of ocular lesions was absent in the 5 per cent tyrosine-5 per cent cystine combination (rat No. 4826 above).

Comparison of these animals with those receiving tyrosine or cystine alone appears to confirm the clinical impression of an antagonism between the two amino acids in so far as regards their toxic effects.

GLUTAMIC ACID

Glutamic acid fed at 10 per cent level produced at most slightly greater renal and hepatic changes than the basal 4 per cent casein diet. Rats Nos. 4820, 4821, and 4823 showed findings essentially similar to those in rat No. 4822, whose protocol is cited below.

Protocol No. 936; rat No. 4822

Spleen.—Pulp anemic with moderate number of lymphocytes and few megakaryocytes; follicle of moderate size, with some perifollicular reticulum cell hyperplasia.

Liver.—Liver cells finely to coarsely vacuolated near centers of lobules, the vacuoles containing solid or centrally clear ring-shaped fat globules which stain intensely red with Sudan IV, often deep blue with Nile-blue sulphate, and are usually singly refracting. No focal necroses.

Kidney.—The convoluted tubular epithelium is cloudy, indistinctly striated or finely granular, the rod borders sometimes swollen and hyaline, and usually without appreciable fatty changes. The tubules often contain foamy coagula, small globules of hyaline, or hyaline casts.

GLUTAMIC ACID, CYSTINE, AND GLYCINE

These amino acids were mixed in approximately the proportion in which they occur in glutathione and fed to a series of four rats (Nos. 4873, 4874, 4875, and 4876). The diet contained 10 per cent cystine, 6.5 per cent glycine, and 12.5 per cent glutamic acid.

With this combination the same periportal hemorrhagic and coagulative necroses as seen in cystine poisoning appear in the liver, but the fatty changes of pure cystine poisoning in the liver are largely suppressed. There is only moderate parenchymatous and slight or no fatty degeneration in the kidney.

The protocol of rat No. 4875 (901) may be considered as illustrative:

Spleen.—Pulp contains rather numerous lymphocytes and megakaryocytes.

Kidney.—Epithelium of convoluted tubules in part swollen and granular, with sometimes serous exudate in lumen, and deposition of fine droplets of fat

in the basal part of the epithelial cells in some tubules. Basal striation is retained best in the subcapsular tubules. No fatty acids or lipoids are seen.

Liver.—Areas of periportal coagulative and hemorrhagic necrosis, incompletely surrounding the portal tissues, or not involving some of periportal zones, and scattered areas of fine droplet fatty degeneration of liver cells often adjoining areas of necrosis or entering areas of hemorrhage.

Fatty acids and doubly refracting material appear to be absent.

Rat No. 4874 differed from the other three in that the periportal necroses were purely coagulative in type.

GLUTATHIONE

Two rats (Nos. 4806 and 4807) were fed on 25 per cent glutathione, with the production of hepatic changes strongly resembling those of cystine poisoning. Periportal necroses were present only in one, this rat also showing quite severe renal degenerative changes.

The protocols of both rats are cited.

Protocol No. 889; rat No. 4806 (died, immediate autopsy)

Thymus.—No evident abnormality. Juvenile type.

Kidney.—Epithelium of convoluted tubules swollen, usually granular, lumina almost occluded, collecting tubules normal. Occasional granular cast. Many of the swollen convoluted tubules show fine fat droplets basally (red by Sudan IV, singly refracting in acetone alcohol sudan preparations, unstained by Nile blue), and in some groups of tubules numerous doubly refracting crystals, but none in most areas.

Liver.—Definite zones comprising about one-third of the lobules about the portal areas show congestion and coagulation necrosis of the hepatic cells, the form of the strongly oxyphil completely karyolyzed cells being preserved and well-stained endothelial cell nuclei persisting between them. The balance of the lobule shows fine to medium sized vacuoles in the liver cells which contain fat staining solidly with Sudan IV or in the form of a ring or crescent about a central unstained globule; in similar form and dark blue with Nile-blue sulphate and nearly all singly refracting.

Spleen.—Moderate congestion of pulp, moderate perifollicular reticulum cell hyperplasia.

Protocol No. 886; rat No. 4807

Spleen.—Marked swelling and hypertrophy of follicles, without lymphoblastic centers for most part, compressed, relatively atrophic pulp, with trabecular fibrosis.

Kidney.—Slight foamy serous exudate within cortical tubules, basal striation usually retained, occasional convoluted tubule shows swollen finely granular area toward lumen. No appreciable fatty changes.

Liver.—Marked fatty degeneration, with large fat droplets, which often appears as rings of fat deep red by Sudan IV about a central pale or clear area. The fat is deposited in liver cells, largely in the intermediate zone, sometimes reaching the hepatic venules. Scattered lipoid crystals are seen among the fat droplets. The fat stains blue by Nile-blue sulphate. Some of the cells abutting on portal areas show increased oxyphilia but no definite necrosis.

SUMMARY

1. The basic diet containing only 4 per cent casein as the main source of protein produces a moderate centrilobular fatty degeneration in the liver.

2. The addition of 10 per cent glycine to the basic diet produces an increase in hepatic fat deposition.

3. The addition of 20 per cent lysine to the basic diet produces a parenchymatous and fatty degeneration of the renal convoluted tubules and a diffuse fatty degeneration of the liver without necrosis.

4. The addition of 20 per cent tryptophane to the basic diet produces a moderate parenchymatous degeneration of the renal tubules.

5. The addition of cystine to the basic diet in levels of 5 to 20 per cent produces parenchymatous and fatty degeneration of the renal convoluted tubules of increasing grade, and a more or less diffuse fatty degeneration of the liver, with, in levels of 10 and 20 per cent, areas of periportal coagulative and hemorrhagic necrosis.

6. The addition of tyrosine to the basic diet in levels of 2.5 to 20 per cent produced reddening and edema of the extremities, an exudative blepharitis, central degeneration of the crystalline lens, and a minor grade of parenchymatous degeneration of the kidney. The hepatic fatty changes seen when the basic diet alone is fed were present in low levels and absent in high levels of tyrosine feeding.

7. When 5 per cent cystine and 5 or 10 per cent tyrosine were fed simultaneously, those rats which died in the course of the experiment showed the periportal necroses of cystine poisoning. In these the fatty changes of cystine poisoning were absent with the higher level of tyrosine. The animals which were killed showed renal degenerative changes on the lower tyrosine level, but not on the higher, and no hepatic lesions except in one animal which showed incipient periportal necrosis and fatty degeneration. Ocular changes were not manifest on the lower tyrosine level, but present on the higher. There appears also histologically to be an antagonism between these two amino acids.

8. The addition of 10 per cent glutamic acid to the basic diet produced little or no significant change as compared with the basic diet alone.

9. When 10 per cent cystine, 6.5 per cent glycine, and 12.5 per cent glutamic acid (approximately the proportions in glutathione) were fed together the periportal necroses of cystine poisoning appear, but the hepatic fatty changes are largely suppressed, and the renal degenerative changes are decreased.

10. Two rats fed 25 per cent glutathione showed hepatic fatty changes, and in one periportal necroses and severe renal degeneration were noted.

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COURT DECISION RELATING TO PUBLIC HEALTH

Law for licensing of milk dealers construed; licensing regulation of city board of health held invalid.—(New Hampshire Supreme Court; *Whitney v. Watson et al.*, Board of Health, 157 A. 78; decided Nov. 3, 1931.) Section 4 of Chapter 163, Public Laws, provided as follows:

The boards of health of cities and the selectmen of towns may grant to any person who applies therefor and pays the sum of \$2 a license to sell milk, skim milk, and cream within their city or town, until June 1 next following, and may renew such license annually in the month of May upon application and the payment of a like fee: *Provided*, That said applicant will satisfy the board of health or selectmen that he understands the care and handling of said product, and files the name and address of all his producers, and gives reasonable assurance that the cows from which the milk is taken are healthy and properly fed and cared for. Any person selling only the product of his own cows shall be exempt from paying any fee for such license.

In connection with the issuance of licenses to sell milk in the city of Manchester, the board of health of said city on March 26, 1928, voted as follows:

That no more distributors' licenses to sell milk in Manchester be granted to nonresidents of Manchester; * * * This vote is not to affect licenses in force at this date.

The plaintiff, who owned and operated a milk farm in Bedford, 6 miles from Manchester, desired to sell his product direct to consumers in Manchester, and on July 3, 1931, applied for a license under the above statute. He filed his name and address, satisfied the city board of health that he understood the care and handling of his product, and gave them reasonable assurance that the cows were healthy and properly fed and cared for, but the board refused to grant him a license because his plant was outside of Manchester and because he did not hold a license on March 26, 1928. The plaintiff then sought by mandamus to compel the issuance of a license to him. It appeared that the board had granted licenses after March 26, 1928, to other nonresidents whose plants were farther removed from the

city than was plaintiff's plant, but that such cases were renewals of licenses held on March 26, 1928. The trial court decided that the plaintiff was entitled to a license and the defendants carried the case to the supreme court.

One of the defendants' contentions was that the conditions laid down by the statute as prerequisite to the granting of a license, being preceded by "may" instead of "shall", were merely minimum requirements to which others could be added by the board in its discretion. But the supreme court held that this contention could not be maintained, as an unguided and unrestrained discretion in the board would make the act unconstitutional. The court stated that the legislature had seen fit to specify definite conditions controlling the board's action and that, the requirements having been fixed by the legislature, the board's function was limited to determining whether an applicant complied therewith. "It is a familiar rule of statutory construction," said the court, "that the word 'may' shall be construed to mean 'shall' when such appears to be the intention of the legislature. * * * It was the intention of the legislature to make the issue of licenses mandatory when the conditions have been complied with."

Regarding the requirement of the statute that the applicant give the board "reasonable assurance that the cows from which the milk is taken are healthy and are properly fed and cared for," the court said that this "necessarily means an assurance not only as respects conditions at the instant of the grant but as to their probable continuance during the term of the license." It was declared to be obvious that, if the assurance mentioned in the statute could not be had without a view and physical examination of an applicant's plant, some limitation of the area in which they were to be had and conducted must have been contemplated, but, the search being for the line limiting the area of practical administration, the city boundary considered alone, was stated by the court to have no significance.

Distance, moreover, may not be the test. Topographical transportation and other conditions may figure in the problem. What are the reasonable limits under all the conditions is a question for the board, subject to revision by the court if not fixed by the exercise of a reasonable discretion.

The court declared the board's rule adopted on March 26, 1928, to be invalid, saying:

As a [the] rule, however, by its terms as well as by practical construction, authorizes the issue of licenses to some nonresidents, it can not be construed as a finding that the bounds of Manchester limit the field of practical administration. As the rule can be sustained on no other basis, its invalidity follows.

Moreover, the rule is invalid, as respects the plaintiff, because it limits the issue of nonresident licenses to such applicants as already held them. While knowledge of an applicant and of his products, gained by observation of the conduct of his business under past licenses, may be valuable evidence bearing on his fitness and

that of his herd, it is clear that mere priority in the field affords no conclusive test of such qualifications. The limitation is an arbitrary discrimination. It accords different treatment to persons similarly situated. A statutory rule to the same effect would have been in conflict with both the State and Federal Constitutions. * * *

The court held that the plaintiff was entitled to a license.

DEATHS DURING WEEK ENDED DECEMBER 19, 1931

Summary of information received by telegraph from industrial insurance companies for the week ended December 19, 1931, and corresponding week of 1930. (From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce)

	Week ended Dec. 19, 1931	Corresponding week, 1930
Policies in force.....	74, 393, 230	74, 932, 777
Number of death claims.....	13, 691	13, 608
Death claims per 1,000 policies in force, annual rate.....	9. 6	9. 5
Death claims per 1,000 policies, first 51 weeks of year, annual rate.....	9. 6	9. 6

Deaths¹ from all causes in certain large cities of the United States during the week ended December 19, 1931, infant mortality, annual death rate, and comparison with corresponding week of 1930. (From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce)

[The rates furnished in this summary are based upon mid-year population estimates derived from the 1930 census]

City	Week ended Dec. 19, 1931				Corresponding week, 1930		Death rate ² for the first 51 weeks	
	Total deaths	Death rate ²	Deaths under 1 year	Infant mortality rate ³	Death rate ²	Deaths under 1 year	1931	1930
Total (82 cities).....	7, 926	11. 6	585	46	11. 9	653	11. 8	11. 9
Akron.....	35	6. 9	8	79	9. 6	2	7. 5	7. 8
Albany.....	43	17. 4	3	60	12. 2	0	14. 1	14. 7
Atlanta.....	78	14. 7	10	98	16. 3	8	14. 9	15. 3
White.....	38	10. 7	5	75	14. 4	5	11. 5	11. 4
Colored.....	40	22. 4	5	144	20. 1	3	21. 6	23. 0
Baltimore.....	239	15. 3	22	77	12. 2	13	14. 2	13. 9
White.....	178	13. 9	20	89	11. 8	12	12. 9	12. 7
Colored.....	61	21. 7	2	32	13. 8	1	19. 9	19. 7
Birmingham.....	59	11. 4	10	100	12. 2	7	13. 0	13. 5
White.....	32	10. 0	7	119	8. 4	3	10. 0	10. 0
Colored.....	27	13. 7	3	73	18. 3	4	17. 9	19. 2
Boston.....	199	13. 2	14	40	12. 9	21	14. 1	14. 0
Bridgeport.....	32	11. 3	3	50	12. 1	1	11. 1	10. 9
Buffalo.....	121	10. 9	4	18	12. 8	8	12. 8	12. 9
Cambridge.....	26	11. 9	2	41	13. 8	3	12. 0	11. 8
Camden.....	32	14. 0	4	69	9. 7	1	14. 2	13. 3
Canton.....	18	8. 8	0	0	9. 9	1	9. 9	9. 8
Chicago.....	638	9. 6	45	40	9. 9	32	10. 4	10. 4
Cincinnati.....	124	14. 1	6	36	15. 2	9	15. 7	15. 5
Cleveland.....	187	10. 7	17	50	9. 2	15	11. 0	11. 0
Columbus.....	75	13. 2	3	29	13. 6	9	13. 4	13. 3

See footnotes at end of table.

Deaths¹ from all causes in certain large cities of the United States during the week ended December 19, 1931, etc.—Continued

City	Week ended Dec. 19, 1931				Corresponding week, 1930		Death rate ² for the first 51 weeks	
	Total deaths	Death rate ¹	Deaths under 1 year	Infant mortality rate ¹	Death rate ¹	Deaths under 1 year	1931	1930
Dallas ¹	57	10.9	9	—	11.5	4	11.1	11.4
White	38	8.8	4	—	11.0	3	9.8	10.5
Colored	19	20.9	5	—	13.8	1	17.3	16.1
Dayton	50	11.3	1	14	10.8	1	10.5	9.6
Denver	76	13.6	7	70	17.0	14	13.8	14.9
Des Moines	29	10.5	4	76	10.6	0	11.0	11.6
Detroit	249	7.9	18	28	8.6	45	8.1	9.2
Duluth	22	11.3	1	27	11.8	1	11.2	11.5
El Paso	27	13.4	2	—	17.7	3	15.0	17.0
Erie	25	11.1	1	21	11.7	5	10.4	11.0
Fall River ¹⁷	24	10.9	1	24	13.1	1	11.1	11.6
Flint	24	7.6	2	25	6.6	1	6.8	8.9
Fort Worth ¹	33	10.3	3	—	17.5	5	10.5	11.0
White	27	10.0	2	—	17.8	5	10.1	10.4
Colored	6	11.5	1	—	15.8	0	12.3	13.9
Grand Rapids	34	10.3	1	15	8.6	1	9.0	10.1
Houston ¹	78	13.1	4	—	10.2	12	11.0	12.1
White	56	12.9	4	—	10.3	11	10.2	10.8
Colored	22	13.8	0	—	10.0	1	13.4	15.9
Indianapolis ¹	102	14.4	8	61	12.1	2	13.6	14.3
White	82	13.2	7	61	11.7	2	13.1	13.4
Colored	20	23.1	1	61	15.3	0	17.1	21.1
Jersey City	67	11.0	4	35	11.3	10	11.2	11.3
Kansas City, Kans. ¹	32	13.6	3	66	16.7	7	12.6	11.8
White	24	12.6	3	80	17.9	5	11.9	11.1
Colored	8	17.8	0	0	11.4	2	15.5	14.7
Kansas City, Mo.	79	10.1	4	32	12.5	3	12.8	13.2
Knoxville ¹	28	13.4	2	43	8.8	0	12.6	13.4
White	19	10.8	1	24	7.6	0	11.8	12.4
Colored	9	26.4	1	194	15.1	0	16.7	18.4
Long Beach	36	12.3	2	50	10.2	2	9.9	10.1
Los Angeles	321	12.7	19	55	12.7	34	10.7	11.0
Louisville ¹	73	12.3	6	55	16.3	4	13.7	13.8
White	53	10.6	4	42	13.6	1	12.3	12.0
Colored	20	21.9	2	143	30.7	3	21.2	21.7
Lowell ⁷	40	20.8	7	183	7.3	2	13.0	13.2
Lynn	19	9.6	2	58	11.7	1	9.4	10.5
Memphis ¹	65	13.1	6	64	18.5	7	16.4	16.8
White	33	10.8	2	34	13.6	0	13.3	13.2
Colored	32	16.9	4	116	26.4	7	21.3	22.8
Miami ¹	22	10.2	0	0	15.0	4	11.6	11.1
White	17	10.2	0	0	14.6	1	10.7	9.8
Colored	5	10.3	0	0	16.6	3	14.4	15.4
Milwaukee	91	8.0	9	40	10.7	25	9.1	9.7
Minneapolis	96	10.6	7	45	10.6	11	10.9	10.7
Nashville ¹	38	12.7	5	75	15.6	2	16.7	16.4
White	30	13.9	4	79	11.2	2	14.4	13.8
Colored	8	9.7	1	63	26.7	0	22.7	23.2
New Bedford ⁷	29	13.4	2	52	13.0	3	12.1	11.0
New Haven	53	17.0	7	105	11.5	1	12.6	12.5
New Orleans ¹	148	16.5	13	73	16.9	14	16.5	17.3
White	91	14.3	9	76	15.7	8	13.5	14.3
Colored	57	22.1	4	66	19.8	6	24.0	24.8
New York	1,406	10.3	92	39	10.9	113	11.0	10.7
Bronx Borough	184	7.2	11	31	8.1	8	8.1	7.8
Brooklyn Borough	500	9.9	37	39	9.9	57	10.1	9.8
Manhattan Borough	547	15.7	29	39	15.9	37	16.5	15.9
Queens Borough	134	6.1	12	48	7.2	8	7.1	7.0
Richmond Borough	41	13.1	3	57	14.4	3	13.4	13.8
Newark, N. J.	94	11.0	9	48	10.9	6	11.4	11.9
Oakland	84	15.0	2	25	11.7	3	10.8	11.0
Oklahoma City	39	10.3	1	14	13.6	2	10.6	10.9
Omaha	63	12.8	7	81	10.7	3	13.8	13.5
Paterson	27	10.1	3	61	16.9	5	13.1	12.1
Peoria	18	8.7	1	26	12.8	7	12.3	12.3
Philadelphia	534	14.2	33	48	12.6	35	12.9	12.6
Pittsburgh	169	12.3	21	73	13.4	22	14.2	13.6
Portland, Oreg.	80	13.6	0	0	12.9	3	11.7	12.1
Providence	50	10.2	3	27	15.6	10	12.6	12.8

See footnotes at end of table.

Deaths¹ from all causes in certain large cities of the United States during the week ended December 19, 1931, etc.—Continued

City	Week ended Dec. 19, 1931				Corresponding week, 1930		Death rate ² for the first 51 weeks	
	Total deaths	Death rate ²	Deaths under 1 year	Infant mortality rate ³	Death rate ²	Deaths under 1 year	1931	1930
Richmond ⁴	56	15.8	4	58	13.9	5	15.4	14.8
White.....	39	15.5	3	66	12.8	2	13.0	12.2
Colored.....	17	16.8	1	43	16.7	3	21.3	21.3
Rochester.....	82	12.9	3	28	11.1	5	11.7	11.5
St. Louis.....	206	13.0	17	61	12.6	13	14.7	14.0
St. Paul.....	57	10.8	9	92	10.0	2	10.4	10.1
Salt Lake City ⁵	18	6.6	1	15	14.1	2	11.9	12.6
San Antonio.....	67	14.6	9	—	14.3	2	14.1	15.8
San Diego.....	48	16.0	1	21	10.7	4	13.7	14.5
San Francisco.....	189	15.2	5	33	15.6	4	13.0	13.1
Schenectady.....	20	10.8	3	89	8.2	1	10.9	11.0
Seattle.....	76	10.7	6	59	14.4	6	11.3	10.9
Somerville.....	23	11.4	1	31	12.5	4	8.9	9.7
South Bend.....	19	9.2	1	26	8.9	1	8.0	9.0
Spokane.....	27	12.1	0	0	11.7	1	12.4	12.4
Springfield, Mass.....	30	10.3	4	67	14.9	5	11.4	12.1
Syracuse.....	56	13.7	5	61	11.4	7	11.5	11.6
Tacoma.....	32	15.5	4	111	9.7	1	12.4	12.3
Toledo.....	53	9.3	1	9	13.2	6	11.8	12.7
Trenton.....	41	17.3	2	37	13.1	4	16.2	16.5
Utica.....	37	18.9	1	28	20.0	2	14.3	14.6
Washington, D. C. ⁶	132	14.0	13	72	14.1	4	15.8	15.1
White.....	83	12.2	4	33	11.9	2	13.5	13.0
Colored.....	49	18.9	9	154	10.9	2	22.1	20.8
Waterbury.....	19	9.8	1	25	6.8	1	9.5	9.4
Wilmington, Del. ⁷	33	16.1	1	23	15.7	2	13.8	14.4
Worcester.....	46	12.2	6	86	14.9	1	12.0	12.7
Yonkers.....	24	9.0	2	45	11.9	2	8.3	8.2
Youngstown.....	18	5.4	2	28	10.7	4	9.7	10.4

¹ Deaths of nonresidents are included. Stillbirths are excluded.

² These rates represent annual rates per 1,000 population, as estimated for 1931 and 1930 by the arithmetical method.

³ Deaths under 1 year of age per 1,000 live births. Cities left blank are not in the registration area for births.

⁴ Data for 77 cities.

⁵ Deaths for week ended Friday.

⁶ For the cities for which deaths are shown by color, the percentages of colored population in 1930 were as follows: Atlanta, 33; Baltimore, 18; Birmingham, 38; Dallas, 17; Fort Worth, 16; Houston, 27; Indianapolis, 12; Kansas City, Kans., 19; Knoxville, 16; Louisville, 15; Memphis, 38; Miami, 23; Nashville, 28; New Orleans, 29; Richmond, 29; and Washington, D. C., 27.

⁷ Population Apr. 1, 1930; decreased 1920 to 1930, no estimate made.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers

Reports for Weeks Ended December 26, 1931, and December 27, 1930

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended December 26, 1931, and December 27, 1930

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930
New England States:								
Maine.....	17	8	3	3	698	18	0	0
New Hampshire.....	1	1		12	7	3	0	0
Vermont.....		2			88		0	0
Massachusetts.....	50	62	7	6	249	273	0	3
Rhode Island.....	5	8			473	1	0	0
Connecticut.....	8	11	5	3	58	118	1	0
Middle Atlantic States:								
New York.....	119	104	113	125	160	151	4	6
New Jersey.....	29	48	7	13	22	120	1	2
Pennsylvania.....	88	130			432	406	5	0
East North Central States:								
Ohio.....	101	69	2	7	103	24	2	2
Indiana.....	85	35	26	1	39	138	0	4
Illinois.....	95	146		12	29	208	3	7
Michigan.....	40	16		2	75	49	3	1
Wisconsin.....	8	14	23	41	24	191	0	5
West North Central States:								
Minnesota.....	19	10	1	2	14	24	1	1
Iowa.....	24	12			2		0	24
Missouri.....	56	25	6	3	3	656	4	3
North Dakota.....	10	3					0	0
South Dakota.....	5	13			33	5	0	0
Nebraska.....	20	4		2	26	2	1	3
Kansas.....	38	24	2	1	12	10	1	1
South Atlantic States:								
Delaware.....	11	3			1		0	0
Maryland.....	61	39	22	12	10	18	0	0
District of Columbia.....	12	10		2		12	0	1
Virginia.....								

1 New York City only.
* Week ended Friday.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended December 26, 1931, and December 27, 1930—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930
South Atlantic States—Continued.							°	
West Virginia.....	41	11	8	16	258	31	1	0
North Carolina.....	39	23	4	9	33	50	1	1
South Carolina.....	9	12	252	588	9		0	1
Georgia ¹	20	23	35	42	2	32	1	0
Florida.....	19	6	1	1		25	1	0
East South Central States:								
Kentucky.....	42					19	0	1
Tennessee.....	52	20	31	46	8	24	5	1
Alabama ¹	43	39	21	36	28	122	0	0
Mississippi.....	36	22					0	4
West South Central States:								
Arkansas.....	19	3	7	25	11	1	1	1
Louisiana.....	33	12	8	10	2		1	0
Oklahoma ¹	26	29	19	48	7	19	0	2
Texas.....		33		22		81		1
Mountain States:								
Montana.....	1				43	1	0	0
Idaho.....	2					10	0	1
Wyoming.....	2	1			3		0	1
Colorado.....	3	8			5	43	1	2
New Mexico.....	27	6	1		8	121	1	0
Arizona.....	6	3	3	7		28	0	1
Utah ²			1	15	3	1	0	0
Pacific States:								
Washington.....	1	11			149	6	0	0
Oregon.....	2	5	34	27	9	52	0	0
California ³	60	46	79	57	43	109	2	8

Division and State	Polioomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930
New England States:								
Maine.....	0	3	18	19	0	0	2	2
New Hampshire.....	0	0	12	2	0	0	0	2
Vermont.....	0	0	10	4	25	0	1	0
Massachusetts.....	2	6	292	222	0	0	1	8
Rhode Island.....	0	0	25	31	0	0	0	0
Connecticut.....	1	0	57	55	12	0	1	1
Middle Atlantic States:								
New York.....	7	1	369	436	3	7	23	8
New Jersey.....	2	0	113	142	0	0	1	5
Pennsylvania.....	2	1	428	370	0	0	10	19
East North Central States:								
Ohio.....	2	2	419	381	6	45	10	18
Indiana.....	1	0	83	172	8	53	3	3
Illinois.....	2	4	267	389	36	53	19	17
Michigan.....	4	0	246	134	7	12	8	15
Wisconsin.....	1	1	106	122	13	9	0	2
West North Central States:								
Minnesota.....	1	3	75	61	6	4	1	2
Iowa.....	1	2	35	104	48	17	5	0
Missouri.....	1	0	55	128	14	3	6	4
North Dakota.....	0	1	17	9	11	2	0	0
South Dakota.....	0	1	7	6	3	20	6	1
Nebraska.....	0	2	19	37	12	22	0	1
Kansas.....	0	2	61	46	8	47	1	1

¹ Week ended Friday.

² Typhus fever, 1931, 9 cases: 2 cases in Georgia, 6 cases in Alabama, and 1 case in California.

³ Figures for 1931 are exclusive of Oklahoma City and Tulsa.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended December 26, 1931, and December 27, 1930—Continued

Division and State	Polio-myelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930	Week ended Dec. 26, 1931	Week ended Dec. 27, 1930
South Atlantic States:								
Delaware.....	0	0	6	12	0	0	1	0
Maryland ¹	0	0	74	75	0	0	9	8
District of Columbia.....	0	1	8	23	0	0	1	2
Virginia.....	1							
West Virginia.....	1	1	49	62	2	13	14	8
North Carolina.....	2	1	49	22	0	0	3	1
South Carolina.....	0	1	7	23	0	2	8	6
Georgia ¹	0	0	7	28	0	0	5	6
Florida.....	1	0	0	8	1	0	0	1
East South Central States:								
Kentucky.....	0	0	66	43	0	10	9	5
Tennessee.....	1	0	63	22	9	0	16	5
Alabama ¹	0	2	35	52	1	6	16	12
Mississippi.....	0	0	14	19	6	5	3	5
West South Central States:								
Arkansas.....	0	0	27	9	7	3	5	6
Louisiana.....	0	1	12	11	0	16	39	9
Oklahoma ⁴	0	0	46	66	1	24	8	7
Texas.....		0		19		12		3
Mountain States:								
Montana.....	1	0	35	24	13	11	1	0
Idaho.....	0	1	3	1	0	0	0	0
Wyoming.....	0	1	2	6	0	0	0	0
Colorado.....	0	0	23	55	11	1	0	1
New Mexico.....	1	0	17	8	0	0	10	4
Arizona.....	1	0	6	3	0	0	1	0
Utah ¹	0	0	7	5	0	0	0	0
Pacific States:								
Washington.....	1	1	35	46	45	13	1	1
Oregon.....	1	2	11	8	5	9	2	0
California ¹	1	12	90	76	1	21	3	7

¹ Week ended Friday.

² Typhus fever, 1931, 9 cases: 2 cases in Georgia, 6 cases in Alabama, and 1 case in California.

⁴ Figures for 1931 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Me-nin-go-coccus menin-gitis	Diph-theria	Influ-enza	Ma-laria	Mea-sles	Pel-lagra	Polio-my-e-litis	Scarlet fever	Small-pox	Ty-phoid fever
<i>October, 1931</i>										
Hawaii Territory.....	2	17			99		3	5	0	5
<i>November, 1931</i>										
Illinois.....	21	586	30	15	210	1	87	1,176	71	83
Minnesota.....	7	114	7		72		92	197	10	12
Missouri.....	7	412	46	30	80	1	6	465	9	66
Montana.....	2	18	11		571		8	127	6	11
New York.....	41	419			904		184	1,787	70	92
Oregon.....		8	132		26		1	71	36	13
Rhode Island.....		34			571		3	71	0	0
South Dakota.....		39	8		216		6	61	44	11

October, 1931

Hawaii Territory:	Cases
Chicken pox.....	20
Conjunctivitis, follicular.....	205
Hookworm disease.....	44
Impetigo contagiosa.....	3
Leprosy.....	3
Mumps.....	10
Trachoma.....	18
Whooping cough.....	3

November, 1931

Chicken pox:	
Illinois.....	1,077
Minnesota.....	353
Missouri.....	246
Montana.....	174
New York.....	1,439
Oregon.....	253
Rhode Island.....	70
South Dakota.....	120
Dysentery:	
Illinois.....	33
Illinois (amebic).....	1
Illinois (bacillary).....	3
Minnesota.....	3
Missouri.....	8
Montana.....	1
New York.....	20
Oregon.....	3
German measles:	
Illinois.....	19
Montana.....	9
New York.....	46
Rhode Island.....	7
Impetigo contagiosa:	
Illinois.....	1
Montana.....	11
Oregon.....	64
Lead poisoning:	
Illinois.....	13
Lethargic encephalitis:	
Illinois.....	1
Oregon.....	1
Mumps:	
Illinois.....	133
Missouri.....	19
Montana.....	4
New York.....	398
Oregon.....	56
Rhode Island.....	38
South Dakota.....	33
Ophthalmia neonatorum:	
Illinois.....	34
Missouri.....	1
New York.....	2
Paratyphoid fever:	
Illinois.....	4
New York.....	8

Puerperal septicemia:	Cases
Illinois.....	5
New York.....	8
Rabies in animals:	
Illinois.....	3
Minnesota.....	1
Missouri.....	5
New York.....	3
Oregon.....	1
Rhode Island.....	1
Rabies in man:	
Illinois.....	1
Scabies:	
Oregon.....	81
Septic sore throat:	
Illinois.....	5
Missouri.....	57
Montana.....	4
New York.....	9
Oregon.....	2
Silicosis, pulmonary:	
Montana.....	9
Tetanus:	
Illinois.....	7
New York.....	9
Trachoma:	
Illinois.....	31
Missouri.....	40
Montana.....	2
Oregon.....	3
South Dakota.....	0
Trichinosis:	
New York.....	5
Tularaemia:	
Illinois.....	8
Minnesota.....	6
Missouri.....	1
Typhus fever:	
New York.....	1
Undulant fever:	
Illinois.....	12
Minnesota.....	9
Missouri.....	5
Montana.....	2
New York.....	22
Oregon.....	2
Vincent's angina:	
Illinois.....	19
Montana.....	1
New York.....	65
Oregon.....	8
Whooping cough:	
Illinois.....	1,158
Minnesota.....	38
Missouri.....	440
Montana.....	60
New York.....	1,109
Oregon.....	27
Rhode Island.....	19
South Dakota.....	33

ADMISSIONS TO HOSPITALS FOR THE INSANE, OCTOBER, 1929

Reports for the month of October, 1929, showing new admissions to hospitals for the care and treatment of the insane, were received by the Public Health Service from 119 hospitals, located in 41 States, the District of Columbia, and the Territory of Hawaii. The 119 hospitals had 184,720 patients on October 31, 1929, 98,200 males and 86,520 females, the ratio being 113 males per 100 females.

The following table shows the number of new admissions to these hospitals for the month of October, 1929, by psychoses:

Psychoses	Number of first admissions		
	Male	Female	Total
1. Traumatic psychoses.....	10	7	17
2. Senile psychoses.....	151	123	274
3. Psychoses with cerebral arteriosclerosis.....	183	107	290
4. General paralysis.....	231	60	291
5. Psychoses with cerebral syphilis.....	24	16	40
6. Psychoses with Huntington's chorea.....	4	3	7
7. Psychoses with brain tumor.....	2	0	2
8. Psychoses with other brain or nervous disease.....	36	14	50
9. Alcoholic psychoses.....	137	14	151
10. Psychoses due to drugs and other exogenous toxins.....	11	7	18
11. Psychoses with pellagra.....	17	23	40
12. Psychoses with other somatic diseases.....	33	42	75
13. Manic-depressive psychoses.....	199	240	439
14. Involution melancholia.....	17	47	64
15. Dementia praecox (schizophrenia).....	355	297	652
16. Paranoia and paranoid conditions.....	38	42	80
17. Epileptic psychoses.....	32	27	59
18. Psychoneuroses and neuroses.....	25	44	69
19. Psychoses with psychopathic personality.....	24	13	37
20. Psychoses with mental deficiency.....	50	50	100
21. Undiagnosed psychoses.....	142	101	243
22. Without psychosis.....	177	57	234
Total.....	1,898	1,334	3,232

During the month of October, 1929, there were 3,232 new admissions to the hospitals, 58.7 per cent of these being males and 41.3 per cent females, the ratio being 142 males per 100 females. Four hundred and seventy-seven of the new admissions were reported as undiagnosed or "without psychosis." There were 2,755 new admissions for which a provisional diagnosis was made. Of these 2,755 patients, cases of dementia praecox constituted 23.7 per cent; manic-depressive psychoses, 15.9 per cent; general paralysis, 10.6 per cent; psychoses with cerebral arteriosclerosis, 10.5 per cent; and senile psychoses, 9.9 per cent. These five classes accounted for 1,946 patients, or 70.6 per cent of the new admissions for which a diagnosis was given.

The following table shows the number of patients in the hospitals and on parole on October 31, 1929:

	Total patients on books		
	Male	Female	Total
Total patients on books last day of month:			
In hospitals.....	87, 476	78, 068	165, 544
On parole or otherwise absent, but still on books.....	10, 724	8, 452	19, 176
Total.....	98, 200	86, 520	184, 720

Of the 184,720 patients, 10,724 males and 8,452 females were on parole or otherwise absent but still on the books at the end of the month—10.9 per cent of the males, 9.8 per cent of the females, and 10.4 per cent of the total number of patients.

GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

The 94 cities reporting cases used in the following table are situated in all parts of the country and have an estimated aggregate population of more than 32,650,000. The estimated population of the 87 cities reporting deaths is more than 31,105,000. The estimated expectancy is based on the experience of the last nine years, excluding epidemics.

Weeks ended December 19, 1931, and December 20, 1930

	1931	1930	Estimated expectancy
<i>Cases reported</i>			
Diphtheria:			
46 States.....	1, 958	1, 475	
94 cities.....	644	578	920
Measles:			
46 States.....	3, 246	3, 463	
94 cities.....	807	1, 214	
Meningococcus meningitis:			
46 States.....	69	73	
94 cities.....	41	39	
Pollomyelitis:			
46 States.....	78	91	
Scarlet fever:			
46 States.....	3, 944	3, 896	
94 cities.....	1, 331	1, 435	1, 123
Smallpox:			
46 States.....	312	627	
94 cities.....	12	57	29
Typhoid fever:			
46 States.....	287	313	
94 cities.....	32	53	37
<i>Deaths reported</i>			
Influenza and pneumonia:			
87 cities.....	677	706	
Smallpox:			
87 cities.....	0	0	

City reports for week ended December 19, 1931

The "estimated expectancy" given for diphtheria, poliomyelitis, scarlet fever, smallpox, and typhoid fever is the result of an attempt to ascertain from previous occurrence the number of cases of the disease under consideration that may be expected to occur during a certain week in the absence of epidemics. It is based on reports to the Public Health Service during the past nine years. It is in most instances the median number of cases reported in the corresponding weeks of the preceding years. When the reports include several epidemics, or when for other reasons the median is unsatisfactory, the epidemic periods are excluded, and the estimated expectancy is the mean number of cases reported for the week during nonepidemic years.

If the reports have not been received for the full nine years, data are used for as many years as possible, but no year earlier than 1922 is included. In obtaining the estimated expectancy, the figures are smoothed when necessary to avoid abrupt deviation from the usual trend. For some of the diseases given in the table the available data were not sufficient to make it practicable to compute the estimated expectancy.

Division, State, and city	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
		Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
NEW ENGLAND								
Maine:								
Portland	4	1	1		0	22	4	2
New Hampshire:								
Concord	0	0	0		0	0	0	0
Nashua	0	0	0		0	0	0	0
Vermont:								
Barre	0	0	0		0	0	0	0
Massachusetts:								
Boston	41	39	21	2	1	7	15	15
Fall River	4	5	3		0	3	1	2
Springfield	14	5	0		0	2	6	4
Worcester	6	6	3		0	0	45	5
Rhode Island:								
Pawtucket	0	2	0		0	0	0	0
Providence	4	8	4		0	231	6	8
Connecticut:								
Bridgeport		5						
Hartford	3	7	2		0	0	7	4
New Haven	33	2	0	1	0	0	4	3
MIDDLE ATLANTIC								
New York:								
Buffalo		15						
New York	150	175	120	13	5	28	47	145
Rochester	17	5	1	1	0	34	5	3
Syracuse	13	2	0		0	1	1	4
New Jersey:								
Camden	2	6	6		0	1	0	2
Newark	23	17	1	1	0	2	7	16
Trenton	1	2	1		0	0	3	0
Pennsylvania:								
Philadelphia	99	63	6	11	7	2	14	56
Pittsburgh	49	20	10	1	1	104	67	18
Reading	26	2	0		0	0	0	1
Scranton	2		0		0	1	0	0
EAST NORTH CENTRAL								
Ohio:								
Cincinnati	15	11	15		1	0	0	5
Cleveland	186	37	15	12	3	43	70	13
Columbus	4	6	21	2	2	1	3	3
Toledo	56	8	6		0	2	2	6
Indiana:								
Fort Wayne	3	4	9		0	0	0	1
Indianapolis	47	9	3		0	1	48	7
South Bend	9	1	0		0	2	0	2
Terre Haute	5	1	2		0	0	0	0
Illinois:								
Chicago	125	120	63	2	1	21	5	48
Springfield	1	2	1		0	0	1	2

City reports for week ended December 19, 1931—Continued

Division, State, and city	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
		Cases, estimated expect- ancy	Cases reported	Cases reported	Deaths reported			
EAST NORTH CENTRAL—continued								
Michigan:								
Detroit.....	66	55	41	-----	2	6	13	14
Flint.....	32	3	0	-----	0	0	15	3
Grand Rapids.....	7	1	0	-----	1	19	6	0
Wisconsin:								
Kenosha.....	11	1	0	-----	0	0	4	0
Madison.....	4	3	6	-----	1	1	0	-----
Milwaukee.....	74	14	2	-----	0	6	32	4
Racine.....	29	2	0	-----	0	0	59	1
Superior.....	5	0	0	-----	0	0	11	1
WEST NORTH CENTRAL								
Minnesota:								
Duluth.....	15	0	0	-----	0	2	0	1
Minneapolis.....	31	17	6	-----	0	1	29	4
St. Paul.....	9	6	4	1	1	0	1	4
Iowa:								
Davenport.....	6	1	0	-----	-----	0	0	-----
Des Moines.....	0	1	19	-----	-----	0	0	-----
Sioux City.....	16	0	5	-----	-----	0	0	-----
Waterloo.....	11	0	1	-----	-----	0	1	-----
Missouri:								
Kansas City.....	18	7	16	-----	0	0	2	7
St. Joseph.....	1	1	5	-----	0	0	0	0
St. Louis.....	28	41	35	1	1	1	2	7
North Dakota:								
Fargo.....	15	0	0	-----	0	7	0	1
South Dakota:								
Aberdeen.....	14	0	0	-----	-----	25	0	-----
Nebraska:								
Omaha.....	10	7	15	-----	0	0	0	6
Kansas:								
Topeka.....	6	1	3	-----	0	1	0	0
Wichita.....	18	2	8	-----	0	1	0	5
SOUTH ATLANTIC								
Delaware:								
Wilmington.....	1	2	2	-----	0	0	0	7
Maryland:								
Baltimore.....	28	23	13	13	3	2	45	23
Cumberland.....	5	0	0	-----	0	0	0	0
Frederick.....	0	0	2	-----	0	1	0	0
District of Columbia:								
Washington.....	3	17	16	1	0	0	0	10
Virginia:								
Lynchburg.....	4	3	1	-----	0	0	0	1
Norfolk.....	11	2	2	-----	0	0	4	1
Richmond.....	0	9	11	-----	1	0	0	5
Roanoke.....	10	2	1	-----	0	0	0	0
West Virginia:								
Charleston.....	1	1	2	-----	0	1	0	0
Huntington.....	0	3	3	-----	0	0	0	0
Wheeling.....	8	2	0	-----	0	1	0	4
North Carolina:								
Raleigh.....	4	2	1	-----	0	7	0	1
Wilmington.....	3	1	1	-----	0	0	0	1
Winston-Salem.....	10	2	1	-----	0	1	1	1
South Carolina:								
Charleston.....	0	1	1	15	0	0	0	3
Columbia.....	0	0	1	-----	0	0	0	10
Greenville.....	0	-----	0	-----	0	0	0	0
Georgia:								
Atlanta.....	6	6	2	8	2	0	1	2
Brunswick.....	0	0	0	-----	0	0	1	0
Savannah.....	1	3	3	13	0	0	1	3
Florida:								
Miami.....	4	2	4	-----	0	0	0	3
Tampa.....	1	1	2	-----	0	0	0	1

City reports for week ended December 19, 1931—Continued

Division, State, and city	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumo- nia, deaths reported
		Cases, estimated expect- ancy	Cases reported	Cases reported	Deaths reported			
EAST SOUTH CENTRAL								
Kentucky:								
Covington.....	0	2	0		0	0	0	1
Lexington.....	1		2		0	0	0	1
Louisville.....	2		5		0	0	1	11
Tennessee:								
Memphis.....	3	6	12		1	2	0	8
Nashville.....	1	2	3		0	0	0	4
Alabama:								
Birmingham.....	4	6	8	2	0	0	3	6
Mobile.....	0	1	3		0	0	0	0
Montgomery.....	0	2	1	1		7	3	
WEST SOUTH CENTRAL								
Arkansas:								
Fort Smith.....	2	1	0			0	1	
Little Rock.....	1	1	3		0	0	0	0
Louisiana:								
New Orleans.....	1	14	13	1	3	0	0	10
Shreveport.....	3	1	1		0	12	0	1
Oklahoma:								
Muskogee.....	11		3		0	0	1	0
Texas:								
Dallas.....	0	16	17		0	1	0	11
Fort Worth.....	4	7	15		0	1	0	3
Galveston.....	0	1	8		0	0	0	1
Houston.....	0	10	11		0	0	0	10
San Antonio.....	0	4	3		2	0	0	8
MOUNTAIN								
Montana:								
Billings.....	0	0	0		0	32	0	0
Great Falls.....	7	0	0		0	0	0	0
Helena.....	0	0	0		0	51	0	0
Missoula.....	0	0	1		0	0	0	0
Idaho:								
Boise.....		0						
Colorado:								
Denver.....	41	8	10		2	2	3	18
Pueblo.....	15	1	0		0	0	0	1
New Mexico:								
Albuquerque.....	8	1	3		0	0	1	2
Arizona:								
Phoenix.....	0	0	0		0	0	0	2
Utah:								
Salt Lake City.....	63	3	0		0	0	1	3
Nevada:								
Reno.....	0	0	0		0	0	0	0
PACIFIC								
Washington:								
Seattle.....	39	4	7			93	24	
Spokane.....	12	1	0			0	0	
Tacoma.....	13	3	1		0	0	3	3
Oregon:								
Portland.....	13	10	0	9	1	2	15	13
Salem.....	5	0	0	5	0	0		1
California:								
Los Angeles.....	34	33	36	48	3	5	2	24
Sacramento.....	4	2	1	2	2	36	1	10
San Francisco.....	52	14	4	32	1	16	5	14

City reports for week ended December 19, 1931—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuber- culosis, deaths reported	Typhoid fever			Whoop- ing cough, cases reported	Deaths, all causes
	Cases, esti- mated expect- ancy	Cases re- ported	Cases, esti- mated expect- ancy	Cases re- ported	Deaths re- ported		Cases, esti- mated expect- ancy	Cases re- ported	Deaths re- ported		
NEW ENGLAND											
Maine:											
Portland	2	4	0	0	0	0	0	0	0	1	23
New Hampshire:											
Concord	0	6	0	0	0	0	0	0	0	0	12
Nashua	0	0	0	0	0	0	0	0	0	0	
Vermont:											
Barre	0	0	0	0	0	1	0	0	0	0	1
Massachusetts:											
Boston	68	82	0	0	0	4	1	1	0	35	199
Fall River	4	9	0	0	0	2	0	0	0	3	24
Springfield	7	9	0	0	0	1	0	0	0	4	32
Worcester	12	38	0	0	0	1	0	0	0	15	46
Rhode Island:											
Pawtucket	3	0	0	0	0	0	0	0	0	0	
Providence	11	21	0	0	0	1	0	0	0	7	50
Connecticut:											
Bridgeport	8		0				0				
Hartford	6	3	0	0	0	0	0	0	0	3	40
New Haven	3	3	0	0	0	0				12	53
MIDDLE ATLANTIC											
New York:											
Buffalo	24		0				0				
New York	149	165	1	1	0	87	10	9	1	110	1,406
Rochester	10	46	0	0	0	1	1	1	0	6	79
Syracuse	10	16	0	0	0	0	0	0	0	75	56
New Jersey:											
Camden	4	5	0	0	0	0	0	0	0	1	32
Newark	16	16	0	0	0	3	1	0	0	28	97
Trenton	3	3	0	0	0	4	0	0	0	0	41
Pennsylvania:											
Philadelphia	73	115	0	0	0	33	2	1	0	134	534
Pittsburgh	37	48	0	0	0	5	1	0	0	38	159
Reading	2	1	0	0	0	2	0	0	0	8	31
Scranton		17		0	0	0		0	0	1	
EAST NORTH CEN- TRAL											
Ohio:											
Cincinnati	17	36	0	1	0	7	0	0	0	7	124
Cleveland	35	70	0	0	0	16	1	0	0	133	187
Columbus	11	17	1	0	0	4	0	0	0	11	75
Toledo	13	9	0	0	0	6	1	1	0	36	53
Indiana:											
Fort Wayne	4	1	1	0	0	0	0	0	0	2	22
Indianapolis	11	6	4	0	0	3	0	0	0	9	
South Bend	3	2	0	0	0	1	0	0	0	0	19
Terre Haute	3	0	1	0	0	1	0	0	0	0	21
Illinois:											
Chicago	116	121	1	6	0	35	3	0	0	170	638
Springfield	2	7	0	0	0	1	0	0	0	6	13
Michigan:											
Detroit	91	132	0	0	0	15	1	1	0	98	249
Flint	11	4	1	0	0	0	0	0	0	4	24
Grand Rapids	10	9	0	0	0	0	0	0	0	5	34
Wisconsin:											
Kenosha	1	4	0	0	0	0	0	0	0	8	10
Madison	3	1	0	0			0	0		1	
Milwaukee	23	21	0	0	0	1	0	0	0	86	91
Racine	4	3	0	0	0	0	0	0	0	6	12
Superior	3	1	0	0	0	1	0	0	0	0	5
WEST NORTH CEN- TRAL											
Minnesota:											
Duluth	10	1	1	0	0	2	0	0	0	1	22
Minneapolis	42	21	0	0	0	1	0	0	0	17	96
St. Paul	20	2	2	0	0	7	1	0	0	12	60

City reports for week ended December 19, 1931—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuber- culosis, deaths re- ported	Typhoid fever			Whoop- ing cough, cases re- ported	Deaths, all causes
	Cases, esti- mated expec- tancy	Cases re- ported	Cases, esti- mated expec- tancy	Cases re- ported	Deaths re- ported		Cases, esti- mated expec- tancy	Cases re- ported	Deaths re- ported		
WEST NORTH CENTRAL—continued											
Iowa:											
Davenport.....	1	4	0	0			0	0		0	
Des Moines.....	9	2	0	0			0	0		0	29
Sioux City.....	3	2	0	0			0	0		1	
Waterloo.....	1	0	0	0			0	0		8	
Missouri:											
Kansas City.....	15	13	1	0	0	4	0	0	0	18	70
St Joseph.....	3	0	0	0	0	2	0	0	0	0	21
St. Louis.....	36	17	0	0	0	15	2	0	0	89	206
North Dakota:											
Fargo.....	2	3	0	0	0	0	0	0	0	2	5
South Dakota:											
Aberdeen.....	1	1	0	0			0	0		5	
Nebraska:											
Omaha.....	7	10	2	2	0	2	0	0	0	1	53
Kansas:											
Topeka.....	2	0	1	0	0	1	0	0	0	4	10
Wichita.....	4	3	0	0	0	2	0	0	0	2	46
SOUTH ATLANTIC											
Delaware:											
Wilmington.....	3	5	0	0	0	1	0	1	0	7	33
Maryland:											
Baltimore.....	26	24	0	0	0	21	2	2	2	121	239
Cumberland.....	1	3	0	0	0	0	0	0	0	2	10
Frederick.....	1	4	0	0	0	0	0	0	0	10	5
District of Col.:											
Washington.....	20	25	0	0	0	9	1	0	0	24	132
Virginia:											
Lynchburg.....	2	1	0	0	0	0	0	0	0	7	10
Norfolk.....	2	6	0	0	0	1	0	0	0	1	
Richmond.....	8	19	0	0	0	2	0	1	0	3	54
Roanoke.....	3	2	0	0	0	0	0	0	0	0	14
West Virginia:											
Charleston.....	2	0	0	0	0	1	0	0	0	1	118
Huntington.....		1		0	0	0	0	0	0	0	1
Wheeling.....	2	2	0	0	0	0	0	0	0	8	14
North Carolina:											
Raleigh.....	2	3	0	0	0	0	0	0	0	0	15
Wilmington.....	1	1	0	0	0	0	0	0	0	4	4
Winston-Salem..	3	0	0	0	0	0	0	0	0	0	11
South Carolina:											
Charleston.....	0	2	0	0	0	1	0	0	0	0	21
Columbia.....	1	4	0	0	0	0	0	0	0	0	27
Greenville.....		2		0	0	0	0	0	0	0	
Georgia:											
Atlanta.....	6	6	0	0	0	4	0	0	0	0	73
Brunswick.....	0	0	0	0	0	0	0	1	0	0	2
Savannah.....	0	0	0	0	0	1	1	0	0	0	36
Florida:											
Miami.....	3	0	0	0	0	1	0	0	0	0	22
Tampa.....	1	1	0	0	0	0	0	0	0	2	21
EAST SOUTH CENTRAL											
Kentucky:											
Covington.....	2	4	0	0	0	1	0	0	0	0	15
Lexington.....		1		0	0	1		0	0	2	19
Louisville.....		14		0	0	1		0	0	8	73
Tennessee:											
Memphis.....	6	7	0	0	0	4	1	2	0	25	65
Nashville.....	4	0	0	0	0	1	1	1	0	0	38
Alabama:											
Birmingham....	4	14	0	0	0	4	1	1	0	1	50
Mobile.....	1	0	0	0	0	0	0	0	0	0	15
Montgomery....	2	2	0	0			0	0		3	

13 deaths nonresidents.

City reports for week ended December 19, 1931—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuber- culo- sis, deaths re- ported	Typhoid fever			Whoop- ing cough, cases re- ported	Deaths, all causes
	Cases, esti- mated expect- ancy	Cases re- ported	Cases, esti- mated expect- ancy	Cases re- ported	Deaths re- ported		Cases, esti- mated expect- ancy	Cases re- ported	Deaths re- ported		
WEST SOUTH CENTRAL											
Arkansas:											
Fort Smith.....	1	0	0	0	0	0	0	0	0	2	0
Little Rock.....	2	1	0	0	0	1	1	0	0	0	2
Louisiana:											
New Orleans.....	8	9	0	1	0	11	2	6	2	1	148
Shreveport.....	0	1	0	0	0	3	0	1	1	2	37
Oklahoma:											
Muskogee.....		0		0	0	0		0	0	2	0
Texas:											
Dallas.....	8	14	2	0	0	2	0	2	0	3	57
Fort Worth.....	5	6	1	0	0	0	0	0	0	0	33
Galveston.....	0	0	0	0	0	0	0	0	0	0	14
Houston.....	3	4	1	0	0	1	0	0	0	0	78
San Antonio.....	2	1	0	0	0	8	0	1	2	0	67
MOUNTAIN											
Montana:											
Billings.....	1	0	0	0	0	0	0	0	0	0	2
Great Falls.....	3	0	1	0	0	1	0	0	0	0	5
Helena.....	0	0	0	0	0	0	0	0	0	0	3
Missoula.....	0	1	0	0	0	0	0	0	0	0	3
Idaho:											
Boise.....	1		0				0				
Colorado:											
Denver.....	14	17	0	0	0	3	1	0	0	12	75
Pueblo.....	1	0	0	0	0	1	0	0	0	5	6
New Mexico:											
Albuquerque.....	1	0	0	0	0	0	0	0	0	0	8
Arizona:											
Phoenix.....	2	0		0	0	4		0	0	0	
Utah:											
Salt Lake City.....	2	10	1	0	0	0	0	0	0	0	18
Nevada:											
Reno.....	0	1	0	0	0	0	0	0	0	0	2
PACIFIC											
Washington:											
Seattle.....	9	8	0	0			1	0		2	
Spokane.....	8	3	4	0			0	0		0	
Tacoma.....	4	1	2	0	0	0	0	0	0	3	32
Oregon:											
Portland.....	8	3	5	1	0	1	0	0	0	2	80
Salem.....	1	0	0	0	0	0		0	0	0	10
California:											
Los Angeles.....	29	31	1	0	0	15	2	0	0	9	321
Sacramento.....	3	0	1	0	0	2	0	0	0	0	42
San Francisco.....	15	5	0	1	0	18	0	1	0	3	201

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Deaths
NEW ENGLAND								
Maine:								
Portland.....	1	0	0	0	0	0	0	0
Massachusetts:								
Boston.....	2	0	0	0	0	0	1	0
Worcester.....	0	0	0	0	0	0	0	1
Rhode Island:								
Providence.....	0	0	0	0	0	0	0	1
Connecticut:								
Hartford.....	1	0	0	0	0	0	0	0

City reports for week ended December 19, 1931—Continued

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
MIDDLE ATLANTIC									
New York:									
New York ¹	6	3	0	0	0	0	1	3	1
Pennsylvania:									
Philadelphia.....	3	0	1	1	0	0	0	0	0
Pittsburgh.....	1	1	0	0	0	0	0	0	0
Scranton.....	0	0	0	0	0	0	0	1	0
EAST NORTH CENTRAL									
Ohio:									
Cincinnati.....	1	2	0	0	0	0	0	0	0
Cleveland.....	0	0	0	0	0	1	1	0	0
Indiana:									
Indianapolis.....	8	1	0	0	0	0	0	0	0
Illinois:									
Chicago.....	3	3	0	0	0	0	0	2	1
Michigan:									
Detroit.....	2	1	0	0	0	0	0	1	0
Grand Rapids.....	0	0	0	0	0	0	0	1	0
Wisconsin:									
Milwaukee.....	1	1	0	0	0	0	0	0	0
WEST NORTH CENTRAL									
Minnesota:									
Minneapolis.....	0	0	0	0	0	0	0	1	0
St. Paul.....	0	0	0	0	0	0	0	2	0
Missouri:									
Kansas City.....	1	0	0	0	0	0	0	1	0
St. Louis.....	7	1	0	0	0	0	0	0	0
Nebraska:									
Omaha.....	0	0	0	0	0	0	0	1	1
SOUTH ATLANTIC^{1 2 3}									
Maryland:									
Baltimore.....	1	0	0	0	0	0	0	0	0
North Carolina:									
Raleigh.....	0	0	0	0	2	1	0	0	0
South Carolina:									
Charleston.....	0	0	0	0	1	0	0	0	0
EAST SOUTH CENTRAL									
Kentucky:									
Louisville.....	1	1	0	0	0	0	0	0	0
Tennessee:									
Memphis.....	0	0	0	0	0	1	0	0	0
WEST SOUTH CENTRAL									
Arkansas:									
Little Rock.....	0	0	0	0	0	1	0	0	0
Louisiana:									
New Orleans.....	1	1	0	0	0	1	0	0	0
PACIFIC									
Washington:									
Spokane.....	1	0	0	0	0	0	0	0	0
California:									
Los Angeles.....	0	0	0	0	0	0	0	0	0
San Francisco.....	1	1	0	0	1	0	0	1	0

¹ Typhus fever, 3 cases: 1 case at New York City, N. Y.; and 2 cases at Savannah, Ga.² Rabies (in man), 1 case and 1 death at Norfolk, Va.³ Dengue, 1 case at Savannah, Ga.

The following table gives the rates per 100,000 population for 98 cities for the 5-week period ended December 19, 1931, compared with those for a like period ended December 20, 1930. The population figures used in computing the rates are estimated mid-year populations for 1930 and 1931, respectively, derived from the 1930 census. The 98 cities reporting cases have an estimated aggregate population of more than 33,000,000. The 91 cities reporting deaths have more than 31,500,000 estimated population.

Summary of weekly reports from cities, November 15 to December 19, 1931—Annual rates per 100,000 population, compared with rates for the corresponding period of 1930¹

DIPHTHERIA CASE RATES

	Week ended—									
	Nov. 21, 1931	Nov. 22, 1930	Nov. 28, 1931	Nov. 29, 1930	Dec. 5, 1931	Dec. 6, 1930	Dec. 12, 1931	Dec. 13, 1930	Dec. 19, 1931	Dec. 20, 1930
98 cities.....	96	100	84	87	101	² 90	93	² 87	² 103	² 94
New England.....	70	123	67	87	58	121	70	128	⁴ 88	143
Middle Atlantic.....	53	52	58	48	54	58	59	47	² 68	62
East North Central.....	91	124	71	122	94	112	86	120	104	116
West North Central.....	174	110	138	110	222	101	168	97	187	89
South Atlantic.....	172	154	144	66	164	112	118	122	118	108
East South Central.....	169	275	145	138	163	143	163	138	157	84
West South Central.....	206	171	206	153	244	² 147	287	² 132	189	² 202
Mountain.....	17	26	26	79	52	18	26	26	⁶ 99	18
Pacific.....	98	63	67	95	88	65	61	55	82	83

MEASLES CASE RATES

	85	126	90	107	113	² 142	118	² 162	² 130	² 194
98 cities.....										
New England.....	233	179	315	162	481	220	656	273	⁴ 683	271
Middle Atlantic.....	92	76	82	69	111	85	89	85	² 81	87
East North Central.....	29	31	15	28	31	28	28	26	60	28
West North Central.....	19	767	13	649	27	053	46	1,077	25	1,416
South Atlantic.....	34	64	28	44	43	62	22	80	26	138
East South Central.....	29	149	35	66	35	155	17	299	52	275
West South Central.....	10	3	24	10	27	² 11	17	² 11	44	² 18
Mountain.....	757	326	1,236	282	757	53	809	150	⁶ 767	167
Pacific.....	149	28	123	10	180	26	210	26	294	6

SCARLET FEVER CASE RATES

	187	195	155	174	179	² 202	222	² 224	² 212	² 234
98 cities.....										
New England.....	260	237	262	264	293	268	397	259	⁴ 451	351
Middle Atlantic.....	163	150	147	148	155	178	199	188	⁴ 195	208
East North Central.....	241	263	169	221	229	257	281	315	264	306
West North Central.....	132	219	117	139	161	108	143	209	138	279
South Atlantic.....	259	216	176	188	172	230	176	260	201	208
East South Central.....	145	209	122	215	128	299	250	377	157	197
West South Central.....	78	94	95	132	108	² 92	142	² 84	101	² 73
Mountain.....	218	282	191	229	218	141	261	211	⁶ 262	300
Pacific.....	129	87	108	83	100	97	153	71	94	83

¹ The figures given in this table are rates per 100,000 population, annual basis, and not the number of cases reported. Populations used are estimated as of July 1, 1931, and 1930, respectively.

² Shreveport, La., not included.

³ Bridgeport, Conn., Buffalo, N. Y., and Boise, Idaho, not included.

⁴ Bridgeport, Conn., not included.

⁵ Buffalo, N. Y., not included.

⁶ Boise, Idaho, not included.

Summary of weekly reports from cities, November 15 to December 19, 1931—Annual rates per 100,000 population, compared with rates for the corresponding period of 1930—Continued

SMALLPOX CASE RATES

	Week ended—									
	Nov. 21, 1931	Nov. 22, 1930	Nov. 28, 1931	Nov. 29, 1930	Dec. 5, 1931	Dec. 6, 1930	Dec. 12, 1931	Dec. 13, 1930	Dec. 19, 1931	Dec. 20, 1930
98 cities.....	1	3	2	8	5	17	4	14	2	19
New England.....	0	0	0	0	55	0	7	0	10	0
Middle Atlantic.....	0	0	0	0	1	0	0	0	10	0
East North Central.....	0	0	0	4	0	1	2	3	4	6
West North Central.....	10	23	11	68	4	48	13	122	4	48
South Atlantic.....	0	0	0	0	0	0	0	0	0	0
East South Central.....	0	0	6	0	0	0	0	0	0	0
West South Central.....	0	3	20	3	3	14	17	17	3	115
Mountain.....	0	44	0	35	0	106	0	150	10	115
Pacific.....	6	6	6	8	10	10	10	6	2	10

TYPHOID FEVER CASE RATES

	12	15	7	10	7	10	9	18	15	18
98 cities.....	12	15	7	10	7	10	9	18	15	18
New England.....	16	17	2	12	5	7	10	19	13	10
Middle Atlantic.....	8	5	4	3	5	8	6	6	15	3
East North Central.....	5	9	5	4	4	10	3	7	1	9
West North Central.....	8	23	8	8	4	6	6	6	0	8
South Atlantic.....	24	28	34	32	16	18	32	4	10	12
East South Central.....	41	12	6	12	12	12	17	18	23	36
West South Central.....	41	84	7	70	27	126	34	122	34	126
Mountain.....	9	53	0	9	26	9	0	0	10	9
Pacific.....	18	10	2	6	10	10	6	6	2	6

INFLUENZA DEATH RATES

	7	10	7	9	7	10	8	10	18	10
91 cities.....	7	10	7	9	7	10	8	10	18	10
New England.....	7	7	0	2	2	5	5	5	13	2
Middle Atlantic.....	6	7	9	11	4	6	8	7	16	5
East North Central.....	4	5	5	7	6	8	3	5	6	10
West North Central.....	6	6	3	0	6	12	6	21	6	15
South Atlantic.....	12	24	6	10	6	20	12	24	12	20
East South Central.....	25	13	13	26	38	13	25	26	6	32
West South Central.....	10	36	17	14	7	134	7	11	17	123
Mountain.....	17	62	26	26	9	18	35	9	18	18
Pacific.....	5	7	7	7	19	2	14	7	14	10

PNEUMONIA DEATH RATES

91 cities.....	101	116	86	100	80	90	98	106	106	111
New England.....	84	126	99	77	91	73	67	119	111	116
Middle Atlantic.....	116	133	98	118	95	101	106	104	115	127
East North Central.....	70	82	52	78	56	77	66	86	63	69
West North Central.....	115	138	106	93	88	132	112	150	103	96
South Atlantic.....	152	156	122	180	146	154	140	134	142	138
East South Central.....	183	175	107	136	95	185	113	123	120	110
West South Central.....	79	114	66	153	135	128	104	162	142	135
Mountain.....	174	167	122	229	122	132	87	159	199	220
Pacific.....	50	50	74	70	77	60	130	60	122	127

¹ Shreveport, La., not included.

² Bridgeport, Conn., Buffalo, N. Y., and Boise, Idaho, not included.

³ Bridgeport, Conn., not included.

⁴ Buffalo, N. Y., not included.

⁵ Boise, Idaho, not included.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—Week ended December 12, 1931.—The Department of Pensions and National Health of Canada reports cases of certain communicable diseases for the week ended December 12, 1931, as follows:

Province	Cerebro-spinal meningitis	Influenza	Poliomyelitis	Smallpox	Typhoid fever
Prince Edward Island ¹					
Nova Scotia		1			9
New Brunswick					12
Quebec			11		8
Ontario	2	4		1	2
Manitoba	1				1
Saskatchewan				8	
Alberta		1			
British Columbia					1
Total	3	6	11	9	33

¹ No case of any disease included in the table was reported during the week.

Quebec Province—Communicable diseases—Week ended December 12, 1931.—The Bureau of Health of the Province of Quebec, Canada, reports cases of certain communicable diseases for the week ended December 12, 1931, as follows:

Disease	Cases	Disease	Cases
Chicken pox	122	Ophthalmia neonatorum	1
Diphtheria	66	Poliomyelitis	11
Erysipelas	3	Scarlet fever	74
German measles	4	Tuberculosis	41
Measles	184	Typhoid fever	12
Mumps	32	Whooping cough	37

CUBA

Habana—Communicable diseases—Four weeks ended December 5, 1931.—During the four weeks ended December 5, 1931, certain communicable diseases were reported in the city of Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Chicken pox	1		Scarlet fever	8	
Diphtheria	20	6	Tuberculosis	41	4
Malaria ¹	19	1	Typhoid fever ¹	10	3
Measles	28				

¹ Many of these cases are from the island outside of Habana.

PORTO RICO

San Juan—Communicable diseases—Four weeks ended December 5, 1931.—During the four weeks ended December 5, 1931, cases of certain communicable diseases were reported in San Juan, P. R., as follows:

Disease	Cases	Disease	Cases
Diphtheria.....	7	Mumps.....	6
Filariasis.....	2	Pellagra.....	1
Influenza.....	3	Poliomyelitis.....	1
Malaria.....	67	Typhoid fever.....	1
Measles.....	83	Whooping cough.....	20

YUGOSLAVIA

Communicable diseases—November, 1931.—During the month of November, 1931, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax.....	51	9	Poliomyelitis.....	3	—
Cerebrospinal meningitis.....	2	2	Scarlet fever.....	856	73
Diphtheria.....	1,240	164	Sepsis.....	7	4
Dysentery.....	67	17	Tetanus.....	24	13
Erysipelas.....	241	11	Typhoid fever.....	426	51
Measles.....	865	7	Typhus fever.....	2	1
Paratyphoid fever.....	6	—			

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

CHOLERA—Continued

[C indicates cases; D, deaths; P, present]

Place	June 28- July 25, 1931	July 26- Aug. 22, 1931	Aug. 23- Sept. 19, 1931	Week ended—														
				Sept. 26, 1931	October, 1931					November, 1931					December, 1931			
					3	10	17	24	31	7	14	21	28	5	12	19	26	
Indo-China (see also table below):																		
Cochin-China—Rachgia.....	5	P 2	2						2	2								
Pnompenh.....	2	1	2															
Saigon and Cholon.....	14				1											P		
	7				1													
Iraq:																		
Abulhasib.....			6															
Amara.....		2	59			2	2	1		3	2	4					P	
Amara Province.....		1	59			1	13	7		15			3					
Basra.....			120	29	24	14	17	10	6	8								
Basra Province.....		547	263	77	19	29	32	38	30	9	1							
Basra.....		287	154	34	11	13	26	7	18	10								
Basra Province.....		5	53	26	14	1	1	3	7									
Dinwaniyah.....		2	30	9	8	1	1	1	4									
Dinwaniyah Province.....			15	1														
Dinwaniyah.....			11	8	14	24	22	1										
Iwaniyah.....			6	5	22	10	5											
Kut Province.....			15															
Muntafiq Province.....																		
Muntafiq Province.....			225	55	54	45	55	17	19	9	23	1	1					
Nasiriyah.....			145	38	57	28	37	10	18	6	17	3						
Nasiriyah.....			168	4	4	18	7	4	7	6	7	2	6					
Suqelshuyukh.....			75	3	4	18	3	3	6	3	6	7						
Suqelshuyukh.....			2															
Suqelshuyukh.....			2							2								
Japan: Taiwan—Kelung.....																		

Place	June, 1931	July, 1931	August, 1931			September, 1931			October, 1931			November, 1931		
			1931			1931			1931			1931		
			1-10	11-20	21-31	1-10	11-20	21-31	1-10	11-20	21-31	1-10	11-20	21-30
Indo-China (French) (see also table above):														
Cambodia ¹	C 308	241	12						1	16	2	3		1
	D 100	60	2						1	16	1			
	C 140	143	30						11	2	1	5		P
Cochin-China ²	D 106	42	32						10	2	1	4		
Persia: ¹														
Abadan.....														
Ahwaz.....														
Khorrarnabad.....														
Mohammerah.....														
Philippine Islands: ¹														
Provinces—														
Capiz.....			35	49	21	5	4							4
Cebu.....			16	35	16	5	3							3
Iloilo.....														
Siam.....														
Ayudhya Province.....														
Bangkok.....														
On vessel:														
S. S. Bandar Shalpour, at Bushire, Persia, from														
Busa.....														
S. S. Kohistan, at Busra, from Bushire, Persia.....														
S. S. Cathay, at Kobe, Japan, from Shanghai.....														
S. S. Kasagi Maru, at Moji, from Shanghai.....														
S. S. Ankoo, at Nagasaki, from Shanghai.....														

¹ On Oct. 23, 1931, cholera was reported at Mohammerah, Abadan, and Ahwaz, Persia. During the period from Oct. 22 to Nov. 7, 1931, 141 cases and 97 deaths were reported. The diagnosis of cholera was not confirmed upon bacteriological examination.

² Figures for cholera in the Philippine Islands are subject to correction.

³ Reports incomplete.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE

[C indicates cases; D, deaths; P, present]

Place	June 28- July 25, 1931	July 25- Aug. 22, 1931	Aug. 23- Sept. 19, 1931	Week ended—													
				October, 1931						November, 1931				December, 1931			
				3	10	17	24	31	7	14	21	28	5	12	19		
Algeria:																	
Algiers.....	C	2	2														
Philippeville.....	C	1	1														
Oran.....	D	P															
Argentina: San Juan Province.....	C																
British East Africa (see also table below):																	
Tanganyika.....	C	6	8	4	2	3											
Uganda.....	D	6	2	4													
Chile: Santiago.....	C	418	289	83	62	67	64	71									
Ceylon: Colombo.....	D	400	281	207	82	63	67	68	69								
Plague-infected rats.....	C	1	0	1	1	2											
China: '.....	D	1	3	1	1	1											
Shansi Province.....	C	8															
Shensi Province.....	C																
Dutch East Indies:																	
Batavia and West Java.....	C	75	53	65	21	31	29	28	34	38	30						
Java and Madura.....	D	75	58	65	21	31	29	28	34	38	39						
Ecuador (see table below).	D	212	205	233	77	69	85	94	97	133	132						
Egypt:																	
Alexandria.....	C	13	9	5	1				1	1	3	1	1	1	1	1	
Assiout.....	D	5	3	2								1	1	1	1	1	
Beheira.....	D																
Dakahlia.....	D			2													
Girga.....	D	1	2														
Kena.....	D	1															
Minieh.....	D																
Port Said.....	D	12															
	D	4															
	D	5															
	D	2															
	D	1															

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place	June, 1931	July, 1931	Aug., 1931	Sep- tem- ber, 1931	Octo- ber, 1931	No- vem- ber, 1931	Place	June, 1931	July, 1931	Aug., 1931	Sep- tem- ber, 1931	Octo- ber, 1931	No- vem- ber, 1931
British East Africa (see also table above):							Madagascar—Continued.						
Kenya.....	154	484	235	14	64		Moromanga Province.....	C	1	3	12	6	
Ecuador.....							Tananarive Province.....	D		3	11	4	
Alamor Parish—Los Hoyos.....	C			1	3					45	65	63	
Amaluza Parish—Cangochapala.....	C				2		Peru.....	D	10	6	63	62	
Calvas Canton.....	C								9	6	19		
Carimanga.....	C			4	1				5	3	2		
Ovejuna.....	C						Callao—Plague-infected rats.....	D	1	14	2		
Celidua Canton—Choras.....	C	1					Senegal:			1			
Loja Canton.....	C				1		Baol.....	C					
Lapaz.....	C								27	101	13	6	2
Namuro.....	C			20			Dakar.....	C		88	8	2	
Paterillo.....	C	1			2				13	194	45	4	
Tuburo.....	C						Diourbel.....	D	64	95	31	4	
Palas Canton—San Antonio.....	C				7				86	106	51		
Indo-China.....	D	2					Louga.....	C			13		10
		1		1	1				3	2	10	1	19
Madagascar (see also table above):		1		1	1		Rufisque.....	C	2	1	4	2	10
Amboitra Province.....	D	2		1	1				34	2	1	7	12
Antsirabe Province.....	C	15	1	1	1		Thies.....	C	12	16	25	1	16
	D	15	1	1	10				6	16	12	7	7
Antsirabe Province.....	C	12	13	19	10		Tiassouane.....	D	3	7	8	5	
	D	12	12	10	10				3	3			
Misinarivo Province.....	C	8	20	14	4				2				
	D		19	12	4								

! Reports incomplete.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place	Week ended—																		
	May 31– June 27, 1931	June 28– July 25, 1931	July 26– Aug. 22, 1931	Aug. 23– Sept. 19, 1931	October, 1931								November, 1931				December, 1931		
					3	10	17	24	31	7	14	21	28	5	12	19			
Chosen (see table below).																			
Colombia: Santa Marta.				1															
Eritrea.		2		10															
				2															
France (see table below).																			
Great Britain:																			
England and Wales.	287	187	91	97	45	41	34	41	39	42	71	68	55	56	57				
Bradford.	5																		
London.	122	54	26	32	5	17	15	21	20	27	55	27	38	27	35				
London and Great Towns.	228	152	69	88	35	31	25	87	31	37	66	45	48	48	53				
	1																		
Sheffield.				2															
Greece (see table below).																			
Honduras:																			
Puerto Castilla.						1						1							
Tegucigalpa.																			
India.	7,413	5,359	2,927	1,705	382	528	258	283	197							8			
Bombay.	1,704	1,352	746	433	100	122	47	55	46				1						
	6	6	2	5															
Calcutta.	5	6	1	1	1								1						
	47	21	13	5	1											1			
Cochin.	41	18	9	5	1														
Karachi.					1	1	2	4	3	2									
	2																		
Madras.	1																		
	2	2	1	1	1	5	6	1	2	2						2	2		
Nagapatam.	1																		
Rangoon.	3	1	2	4	2	1	2	1	1			1				1			
	6	3	4	2	2	1	1	1								2	2		
Tuticorin.	2	1	2	1	1	1	1	1								2	3		
	2															3	1		
Visagapatam.																			
	6	5	5	6	2	4	1	1								4			
India (French):	2	1	4	6															
Chandernagor.	1	3																	

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place	Week ended—																	
	May 31– June 27, 1931	June 28– July 25, 1931	July 26– Aug. 22, 1931	Aug. 23– Sept. 19, 1931	October, 1931					November, 1931				December, 1931				
					3	10	17	24	31	7	14	21	28					
Gold Coast:																		
Akuse.....		2																
Dagomba District.....		1	4															
Kele Krachi.....																		
Kintampo.....		1																
Oda.....		1																
Salaga.....																		
Tamale.....		2																
Wale Wale.....		2	1															
Ivory Coast:																		
Bobo Dioulasso.....		1																
Grand Bassam.....		1																
Kong Circle.....			4															
Seguela.....			2															
Tehini.....			P															
Nigeria.....																		
Senegal:																		
Podor (Hinterland).....																		
St. Louis.....																		
Thies.....																		

Sudan (French).....
Macina—Kayo Circle.....
Togo (French): Atakpame—Anie Circle.....
Upper Volta:	
Banfora.....
Dedougou.....
Diabakoko.....
Onsagadougou.....

X